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TRANSACTIONS

OF THE

AMERICAN

Fish Culturists' Association,

AT ITS FIFTH ANNUAL MEETING,

FEBRUARY 8TH, 1876.

RUTLAND:
TUTTLE & COMPANY, PRINTERS.
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OFFICERS, 1876-7.

ROBT. B. ROOSEVELT, - - - President,
New York City.

GEO. SHEPHERD PAGE, - - Vice-President,
New York City.

EUGENE G. BLACKFORD, - - Treasurer,
New York City.

M. C. EDMUNDS, - - - - Secretary,
Weston, Vt.

EXECUTIVE COMMITTEE.

H. J. REEDER, - - - - Easton, Pa.

FRED. MATHER, - - Honeoye Falls, N. Y.

ALEX. KENT, - - - - Baltimore, Md.

W. F. WHITCHER, - - - Ottawa, Canada.

SETH GREEN, - - - Rochester, N. Y.

REPORT.

The Fifth Annual Meeting of the American Fish Culturists' Association convened at No. 10 Warren Street, New York City, February 8th, 1876, at 10 o'clock, A. M.

The meeting was called to order by Mr. Robert B. Roosevelt of New York City, President of the Association, who in his introductory remarks spoke of the artificial propagation of Sturgeon.

The Secretary of the Society (A. S. Collins), being absent, on motion of Mr. Geo. Shepherd Page, M. C. Edmunds was elected Secretary *pro tempore*.

A letter was read from Mr. B. F. Bowles, Treasurer of the Association, in which he stated that it was impossible for him to meet with the Association, and thereupon George E. Ward was elected Treasurer *pro tempore*.

A paper was received from Seth Green on the propagation of Trout by the Commissioners of Fisheries in New York, and a communication from Dr. E. Sterling of Cleveland, Ohio, on anomalies in the propagation of Whitefish, both of which are herewith appended.

Fred. Mather gave the Association a short account of his experience in Shad culture at the South, under the auspices of the General Government, in which he complains of the want of parent fish in the rivers South to propagate from. He thought the fish, if successfully propagated, in the various Shad streams in Virginia, North Carolina, South Carolina and Georgia, would have to be transplanted from the streams in the North.

Mr. Mather further spoke of his connection with the Centennial Exhibition at Philadelphia. Having been appointed Superintendent of the Live Fish Department, he requested members of the Association to send specimens, and otherwise aid in the display of fish at the Centennial Exhibition.

On motion of B. B. Porter, a committee was appointed to make nominations of officers for the Association the year ensuing.

The President appointed as said committe, B. B. Porter of New Jersey, C. B. Evarts of Vermont, and Wm. M. Hudson of Connecticut.

Dr. Edmunds of Vermont, offered the following Resolution:

Resolved,—That application be made for a room in the Centennial Building at Philadelphia for the collection of books and pamphlets treating on American fish culture.

The resolution was adopted, and the President appointed Geo. Shepherd Page of New York, A. B. Malcomson, Jr. of New York, and John J. Miner of Brooklyn, N. Y., as committee to make application, as provided by the foregoing resolution.

On motion, it was voted that the Association adjourn to meet at 2 o'clock, P. M.

AFTERNOON SESSION.

The Association met pursuant to adjournment, and the report of the nominating committee was taken up, and on motion, adopted.

The Society then proceeded to the election of officers for the year ensuing, and the following named members were duly elected officers of the Society:

For President—Robt. B. Roosevelt, New York City.
For Vice-President—Geo. Shepherd Page, New York City.
For Treasurer—Eugene G. Blackford, New York City.
For Secretary—M. C. Edmunds, Weston, Vt.

For Executive Committee—H. J. Reeder, Fred. Mather, Alex. Kent, W. F. Whitcher, Seth Green.

After the election of officers, Prof. Milner of the Smithsonian Institute, Washington, D. C., entertained the Association with an account of the work accomplished by the United States Fish Commission, which was quite interesting.

H. H. Thomas offered a resolution fixing the price of Trout Eggs, which upon a vote of the Society was lost.

Mr. Eugene G. Blackford then offered a resolution for the consideration of the Society, which he prefaced with the following remarks:

I beg to call the attention of the gentlemen present to a subject of great interest. As the topics treated by the Fish Culturists' Association have augmented in number, so has the interest increased. If we have developed a scientific inquiry into the natural history of the subjects treated by the Society, the practical aims of fish culture have certainly been strengthened thereby. I am desirous of introducing before you a practical subject, one of figures, at which you must not be afraid. It is even something worse than figures, it is statistics. Now we are all of us as yet, working very much in the dark. Let us take the subject of Trout raised by our fish culturists. What do we know about the number of them produced? It is impossible that we should see clearly what we are driving at, unless we start with that which must be the foundation on which we must build. Suppose this was a live stock association, given to the raising of horses or cows. The first thing they would do, being practical people, would be to get some positive data as to production; once production noted, consumption could be readily deduced. It would be of great importance for the Association to know how many Trout were artificially produced, and sold in the various markets of the country. Starting from this point, I should be even desirous of going further. If the

Smithsonian Institute, so ably represented in our Association by Professor Baird, is laboring to account for the increase or diminishing of certain classes of sea fish in various years, this can only be arrived at, by his being fully informed as to the catch of fish on our coast. The hearsay ought to be discarded, and nothing but the positive facts cared for. If France and a portion of England give yearly statistics as to the harvests of the seas, why should we not furnish the same thing to the American public? I should think that so far as regards Trout culturists, the Fish Commissioners of the various States might, without any great trouble, furnish what would be a reliable account of the cultivated Trout sold within their jurisdictions. As to the sea fish, such an important subject, having to do with the food of the people, I do not see why facts in regard to them are not obtainable, though to secure them, the means to be employed would be more difficult. Having these ideas in view, I shall propose the following preamble and resolution :

Whereas, The Fish Culturists' Association believe that data in regard to the catch of staple fish, such as are sold in the markets of the country, would be of great importance, allowing the positive determination of questions of vast commercial and scientific importance, be it

Resolved, That the Fish Culturists' Association request the Fish Commissioners to urge on the State Governments, of which they are the representatives, the necessity of the State appointing certain officers whose duties shall be to collect such data, so that reliable information may be obtained in regard to the catch of staple fish in the various States.

It was voted that the Secretary be instructed to notify all the various State Commissioners of Fisheries of the foregoing resolution.

It was voted that all papers connected with the transactions of this Society be obtained from Mr. Collins, the former Secretary, and published in the future transactions of the Society.

A resolution was offered by Mr. Mather for the formation of a committee to consider the propriety of giving testimonials to inventors of fish hatching apparatus, and report at a future meeting of the Society, which was passed, and the President appointed as such committee Fred. Mather, J. W. Milner and B. Phillips.

Mr. Page offered the following resolution :

Resolved, That Prof. Baird be requested to obtain a place in the Exhibition Buildings at Philadelphia, for the meetings of this Society, and that the Secretary be authorized to call such meeting in connection with the meeting of the State Fish Commissioners, and that the Executive Committee be requested to invite the preparation of papers by, and the attention of prominent fish culturists from our own and foreign countries.

Which upon vote of the Society was adopted.

Mr. Edmunds offered the following resolution :

Resolved, That all breeders of fish in the United States be requested to report at the next annual meeting of this Society, their different modes of propagating fish, and the improvements they have made since beginning in the work.

Which upon a vote of the Society was adopted.

The President, Mr. Roosevelt, offered the following resolution :

Resolved, That Mr. Blackford be requested to make an examination of all fishes coming into his hands for sale in the market, thereby to more definitely find out the different periods of spawning in the various kinds of fish coming under his notice, and report at our next meeting.

On motion of Mr. Page, the Society voted to adjourn, to meet again in annual session on the second Wednesday in February, 1877.

M. C. EDMUNDS,
Secretary.

PROPAGATION OF FISH.

BY SETH GREEN.

Mr. President and Gentlemen of the American Fish Culturists' Association :—

I regret that I cannot be present at the meeting of the American Fish Culturists, but will try and make amends for my absence as well as possible. Since the last meeting, the New York State Fishery Commission have been making some addition to their hatchery at Caledonia, by leasing the Caledonia Trout Ponds of Mr. A. S. Collins. This addition is one that has been greatly needed for some time, as we have been crowded for want of room to put the young fish. Consequently we will this season distribute Brook Trout, in addition to Salmon, Salmon Trout, White Fish, Black Bass, &c.

We shall have about one million Brook Trout Fry to distribute, and the people throughout the State are taking advantage of this opportunity to restock their depleted trout streams. I am receiving orders every day, and shall commence to ship them soon after the 15th of this month. When they are deposited in the streams they should be placed in the head waters in the little rivulets a foot or two wide, that flow into the streams, and not deposited all in one place, but distributed all along the stream so that they will all get food enough, and should there chance to be enemies near, they would have a better show to get out of the way, and if it were possible to deposit them in the night, a much larger percentage would arrive at maturity, as by morning they would all be settled down and find their hiding places in the shallow water along the edges of the stream. I have no doubt but that our depleted

Brook Trout streams can be restocked again. As an incident I will cite an interesting experiment. Four years ago last summer, Mr. Charles Upton, President of the City Bank of Rochester, bought a barren trout stream which he wished to restock with Brook Trout. In the Spring of 1872, I put in 4,000 Brook Trout Fry. During the Summer it could be seen that the stream was alive with the little fellows. The next Summer Mr. Upton began fishing for them. He would drive out occasionally after banking hours, and his take would be from fifty to one hundred during the afternoon. The next season, when they were three years old, his smallest take was twenty and his largest sixty; and last season, when they were four years old, his lowest take in an afternoon was five, and his highest nineteen, many of them weighing a pound each. This I consider a perfect success.

Of Salmon Trout we shall have about 3,000,000, to distribute, and we will have enough to fill all our orders liberally. They are all hatched at present, and are doing finely. They are an excellent fish, and there are more of our little lakes suitable for this kind than any other one kind we have for distribution.

The White Fish Interests are being looked into this season to a greater extent than ever before. The Michigan Fish Commissioners made an arrangement with me last Fall to put the Holton Hatching Box in their hatching house at Detroit. As a consequence, I sent one of my assistants, Mr. Oren Chase, to Detroit, who put the boxes in, and he now has over 8,000,000 White Fish spawn nearly to the hatching point, taken by my brother, Mr. M. A. Green. When I say 8,000,000, I mean 8,000,000, and not one spawn less. The art of taking and hatching White Fish spawn is a special branch of fish culture, and a business by itself. A man may be well educated in the art of taking and hatching the spawn of other fishes, and if he

does not understand it he will make a perfect failure in hatching White Fish.

I consider this one of the greatest successes that has ever been attained in fish culture, and will say right here that in my opinion, the Holton Hatching Box, with the proper attention and care, will hatch more White Fish with less labor and better success, and with greater benefits, than any other hatching box in the world.

I believe the calculation now is to place the 8,000,000 White Fish in Lake Erie, and if this is done, in four years Lake Erie will be in a measure restocked; but the work should not stop here. The Commissioners should keep putting them in for years, and the time will come when tongue will fail to give utterance of praise. The Michigan hatching houses are not the only places where this box is being used. Mr. N. K. Fairbanks of Chicago, Ill., had a small hatching house erected near his Summer residence at Geneva Lake, Wisconsin, for the purpose of stocking Geneva Lake, and he made a contract with me to have the Holton Hatching Box placed in his hatching house. Mr. H. H. Welsher was accordingly engaged by Mr. Fairbanks to take charge of it, and he is now hatching White Fish, Salmon, Salmon Trout and Brook Trout with this same hatching box, with perfect success; in fact the full benefits to be derived from this box is still in the future.

As regards Black Bass, on account of the mildness of the Winter, we have been unable to obtain as large a supply as formerly, but we have enough however to supply the demand. They are an excellent fish, and their merits cannot be over estimated.

There has been a good deal of discussion as to the feasibility of stocking our Shad rivers with Black Bass. I have been asked my opinion a great many times. I would say that it all depends on the nature of the water and the bottom of

the stream. The Black Bass is a good kind of fish to stock a large, clear, rapid river, with stony bottom, where the crawfish and helgamite are to be found. They scarcely ever eat other fish if they can get the crawfish, and I do not recommend putting them in any waters where the crawfish is not plenty, and they are rarely found except among the stones. I would not recommend them for small ponds. If Black Bass are put in small ponds they eat the young of all kinds of fish, bite the old fish, and before starving, would eat themselves if possible. They have the bull dog disposition as far as courage is concerned, but I think they will not kill except for food. They will not be a great drawback to Shad rivers, for the reason that they live in swift running waters and there are not many Shad in the heavy currents of the rivers. If hatched in swift running water they will be carried down to comparatively still water before they are strong enough to hold their own against the current. The first four days after the young are hatched, they go down stream nearly as fast as the current runs in the river; after that time they will resist a moderate current, and are always near the middle of the river, and out of the way of their enemies, which are small fish near the shore.

Last Summer we made a success hatching Sturgeon on the Hudson River. They used to be very plenty, but like all other kinds of fish, were diminishing in number every year, and if it had not been for the discovery of hatching them artificially, they would soon become extinct, and the Albanians would not have any more Albany Beef, and that would be a great calamity! If we can make Sturgeon plenty again, and I have no doubt but that we can, it will be one of the best things we can do to make cheap food for the poor. I remember when they were sold for one cent per pound, while now they sell for ten cents, and I have no doubt that within a few years we can make them so plenty they will be as cheap as they were in old times.

Shad hatching artificially has proved a great success, as has been shown by large Shad being sold cheap in most of the cities of this state They were sold last season for from twenty to twenty-five cents each, which is cheaper than they were ever sold anywhere, away from the river, within the memory of the oldest inhabitant.

Nearly all the rivers between Florida and the Potomac, have been so completely fished out, that there are hardly Shad enough left from which to take the spawn to stock the respective rivers, and if something is not done soon, they could not be restocked without transporting the young Shad from some other rivers. The Potomac and Rapahannock rivers have Shad enough left in them so that they could be restocked in a few years, and all the Southern rivers could be restocked from them.

In experimenting at the New York State hatching house, we have found that the California Salmon can be crossed with the Brook Trout. We have a few thousand Brook Trout spawn impregnated with the milt of the California Salmon. They have not hatched yet, but are far advanced and will hatch in a few days. They may make a good fish to stock some kinds of waters in this country. I shall make a great effort to raise them, and while they are growing will study their habits and growth and can make up my mind what kind of water, if any, they are suitable for. The experiment is a cheap one. I do not believe in expensive experiments for finding new kinds of fish, to stock the waters of this country, as we have plenty of good kinds of fish with which to do this. We should study economy. What I mean by economy is to bring about the greatest amount of work for the least money. The more money there is spent in stocking our waters with food fishes the better will it be for the country, providing it is spent by men who know the kinds of fish with which to stock the different waters in their country.

I am sorry to say that some of our sister states are so very blind and penurious, and make their appropriations so small that the Commissioners could not afford to look at their own shadows if it cost anything, and consequently they can do nothing but answer correspondents and get turned out in a few years for not filling the waters of their respective states with fish. And a very great mistake it is to change Commissioners after they have served one or two years. By changing a Commissioner it sets the state back just as many years as the old Commissioner has served. It takes a few years for him to learn about the number of rivers, lakes and bays he has in his state, and the kinds of fish that are suitable for the different waters; and one of the important things is to know where and how to get the fish, and how to transport them. It is a trade to transport fish long journeys successfully. Nearly every man who has ever carried a few minnows in a pail to fish with, has an idea that he could transport fish a long journey. He will find himself mistaken if he undertakes it.

Yours,

SETH GREEN.

PROPAGATION OF WHITE FISH.

BY DR. E. STERLING.

CLEVELAND, February 4th, 1876.

MR. COLLINS, *Dear Sir*:—It would give me great pleasure to be present at the next meeting of the AMERICAN FISH CULTURISTS' ASSOCIATION, as requested in your letter, but circumstances will not permit. I will, however, comply with

your desire for a short article connected with fish culture; and although I offer nothing new, perhaps it may be used to help sustain former observations.

The *State of Ohio* built this Fall, four experimental White Fish hatching houses, the attending expense to be paid out of the appropriation of $10,000, made last Winter for this purpose. The hatchery here is located on the *Water Works Grounds*, and receives water direct from the inlet pipe which runs out into Lake Erie one mile, and which at its terminus is twenty-five feet below the surface. The first box of eggs was received from Kelley's Island, Ohio, and placed in the trays December 1st. A few on the edges of the box were frozen, and a good part of the remainder pressed badly out of shape, the result of packing. The second box of eggs, all in good condition, from Detroit River, Michigan, were placed in the trays December 15th, making 300,000 altogether in the hatchery. From this number less than 1,000 dead eggs have been removed; three-fourths from box number one, the remainder from box number two. All the frozen eggs died. The temperature of water to date, in hatchery and Lake, has been 38° and 40° (that is temperature the same at each end of aqueduct), most of the time 38°, Far. Last Winter, which was uncommonly severe, the water at the hatchery location stood 34° and 36°. No account of the water was taken at the Lake crib at that time, though undoubtedly it was the same in temperature, as it could undergo little if any change in a passage of a mile and a half through a brick aqueduct five feet in diameter.

The eggs at present are in fine condition, clean and equally well developed, notwithstanding the unusual muddy state of the water, a similar condition not having occurred in several years; and from present appearances over ninety-five per cent will hatch. Between the 20th of January and the 1st of this

month, about 100 young fry made their appearance, but none since the last date. Those eggs which hatched all came from the Detroit River deposit, and none from the Kelley Island box, number one. Why this departure in progressive development should be in favor of box number two, I cannot say, but will leave it for others to explain. Certainly they were all taken from the parent fish at the same date, and have since that time been under like temperature and other local conditions.

The 1st inst., thirty hours before the cold storm of to-day, the temperature of the water fell 2° in the hatchery, that is from 40° to 38°, although out of doors the weather was mild, as it had been for several days previous, the thermometer marking 50° and 55° in the shade, with high barometer increasing to the 1st. Here we have a sudden decrease of 2° in the temperature of this water immediately preceding a storm, without any corresponding fall in the air outside. This is the third time this phenomenon has been noticed since December 1st.

Our experience so far has taught us that we cannot hatch frozen White Fish eggs; second, that fish eggs, like the human head can be pounded out of shape, return to their natural form and continue their vitality; and third, that very muddy water does not at all interfere with the perfect development of the White Fish egg, from its first stage of pregnancy to the actual birth of the young stranger when he comes forth with sac well victualed; and finally, that we believe the eggs on the spawning beds of the Lake will hatch out several weeks before the first of April this season, in case the water remains as at present, 38° Far., and that nature will have the natural food for the White Fish fry ready for the emergency.

Yours Respectfully,

E. STERLING.

TROUT CULTURE.

MUNCEY TROUT PONDS, February 4th, 1876.

Gentlemen of the American Fish Culturists' Association:

I received your postal to-day. I would like to be with you at your meeting, but pressing business will keep me away. I will however say, I am having first rate success in Trout culture. My ponds number six in all, and are one half mile in length. Most of the water is shaded by forest trees; ponds long and narrow, and from three inches to five feet in depth. I have a large amount of Trout, and think I am not far behind any one in raising Trout for the market.

My best respects to you all. Yours Truly,

A. B. SPROUT.

CONSTITUTION.

ARTICLE I.—Name and Objects.

The name of this society shall be "The American Fish Culturists' Association." Its objects shall be to promote the cause of Fish Culture; to gather and diffuse information bearing upon its practical success; the interchange of friendly feeling and intercourse among the members of the Association; the uniting and encouraging of the individual interests of Fish Culturists.

ARTICLE II.—Members.

Any person shall, upon a two-thirds vote of the society, and a payment of three dollars, be considered a member of the Association, after signing the Constitution. The annual dues shall be $3.00.

ARTICLE III.—Officers.

The officers of the Association shall be a President, a Vice-President, a Secretary, a Treasurer and Executive Committee of three members, and shall be elected annually by a majority of votes; vacancies occurring during the year may be filled by the President.

ARTICLE IV.—Meetings.

The regular meetings of the Association shall be held once a year, the time a place being decided upon at the previous meeting.

ARTICLE V.—Changing the Constitution.

The Constitution of the Society may be amended, altered or repealed, by a two-thirds vote of the members present at any regular meeting.

MEMBERS OF THE

AMERICAN FISH CULTURISTS' ASSOCIATION.

Ambler, Andrew S., Danbury, Ct.
Anderson, A. A., Bloomsbury, N. J.
Baird, Spencer F., Washington, D. C.
Betteman, C. G., Greenville, N. J.
Blackford, E G., New York City.
Bowles, B. F., Springfield, Mass.
Boyer, B. Frank, Reading, Pa.
Bradley, Richards, Brattleboro, Vt.
Brewer, J. D., Muncey, Pa.
Bridgman, J. D., Bellows Falls, Vt.
Burges, Arnold, West Meriden, Ct.
Bush, John T., Niagara Falls, Canada.
Chandler, F. J., Alstead, N. H.
Chrysler, Gifford W., Kinderhook, N. Y.
Chrysler, M. H., Kinderhook, N. Y.
Clift, William, Mystic Bridge, Ct.
Colburn, Charles S., Pittsford, Vt.
Collins, A. S., Caledonia, N. Y.
Crocker, A. B., Norway, Maine.
Edmunds, M. C., Weston, Vt.
Evarts, Charles B., Windsor, Vt.
Farnham, C. H., Milton, N. Y.
Farrar, Benjamin, St. Louis, Mo.
Ferguson, T. B., Annapolis, Md.
Gill, Theodore, Washington, D. C.
Goode, G. Brown, Washington, D. C
Green, Seth, Rochester, N. Y.

Hallock, Charles, New York City.
Hessel, Rudolph, Offenburg, Germany.
Heywood, Levi, Gardner, Mass.
Holley, W P., Katonah, N. Y.
Hooper, H. H., Charleston, N. H.
Hunt, J. Daggett, Summit, N. J.
Hunt, N. W., 70 Lee Avenue, Williamsburg, L. I.
Huntington, Dr., Watertown, N. Y.
Jerome, George H., Niles, Mich.
Jewett, George, Fitchburg, Mass.
Kent, Alexander, Baltimore, Md.
Lamberton, Alexander B., Rochester, N. Y.
Ledyard, L. W., Cazenovia, N. Y.
Lees, Edward M., Westport, Ct.
Lowrey, G. P., Tarrytown, N. Y.
Maginnis, Arthur, Stanhope, Pa.
Malcomson, A. Bell, Jr., New York City.
Mann, J. F., Lewiston, Pa.
Mather, Fred, Honeoye Falls, N. Y.
Milner, James W., Washington, D. C.
Neidlinger, Phil., New York City.
Newell, W. H., San Francisco, Cal.
Page, George S. New York City.
Parker, Wilbur F., Meriden, Ct.
Paxton, E. B., Detroit, Mich.
Phillips, B., Brooklyn, N. Y.
Porter, B. B., Oakland, N. J.
Price, Rodman M., Oakland, N. J.
Redding, B. B., San Francisco, Cal.
Redding, George H., Stamford, Ct.
Reeder, H. J., Easton, Pa.
Rockwood, A. P., Salt Lake City, Utah.
Roosevel, Robert B., New York City.
Rupe, A. C., New York City.
Saltus, Nicholas, New York City.

Shultz, Theodore, New York City.
Sprout, A. B., Muncey, Pa.
Sterling, E., Cleveland, Ohio.
Stone, Livingston, Charlestown, N. H.
Stoughton. E. W., Windsor, Vt.
Tagg, Henry, Philadelphia, Pa.
Thomas, H. H., Randolph, N. Y.
Tileston, W. M., (Forest and Stream,) New York City.
Van Cleve, Joseph, Newark, N. J.
Van Wyck, J. T., New York City.
Ward, George E., New York City.
Whitcher, W. F., Ottawa, Ontario, Canada.
Whitcomb, T. J., Springfield, Vt.
Whitin, Edward, Whitinsville, Mass.
Wilmot, Samuel, Newcastle, Ontario, Canada.
Worrall, James, Harrisburgh Pa.

TRANSACTIONS

OF THE

AMERICAN

FISH CULTURISTS'

ASSOCIATION.

1876-77.

TRANSACTIONS

—OF THE—

AMERICAN

Fish Culturists' Association.

SPECIAL MEETING

HELD AT THE CENTENNIAL EXHIBITION, PHILADELPHIA, OCTOBER 6th, 1876.

SIXTH ANNUAL MEETING,

February 14th and 15th, 1877.

New York:
JOHN M. DAVIS, PRINTER, 40 FULTON STREET.
1877.

OFFICERS, 1877-8.

ROBERT B. ROOSEVELT, - - - PRESIDENT.
New York City.

GEO. SHEPHERD PAGE, - - VICE-PRESIDENT.
New York City.

EUGENE G. BLACKFORD, - - - TREASURER.
New York City.

BARNET PHILLIPS, - - - - SECRETARY.
Brooklyn, N. Y.

EXECUTIVE COMMITTEE.

H. J. REEDER, - - - - - *Easton, Pa.*

FRED. MATHER, - - - *Honeoye Falls, N. Y.*

ALEX. KENT, - - - - *Baltimore Md.*

W. F. WITCHER, - - - - *Ottawa Canada.*

SETH GREEN, - - - *Rochester, N. Y.*

REPORT.

SPECIAL MEETING OF THE SOCIETY.

The meeting was called to order by the President at 11:30 o'clock, A. M., in the Judges' Hall, Centennial Buildings, Philadelphia, Pa., and an Address was delivered on "The Advance of American Fish Culture."

Following the Address of the President, Mr. Barrett Phillips read a paper on "The Exhibition of Fish Preparations at the Centennial, and kindred topics."

Mr. Milner gave an account of what had been done in the way of collecting specimens of fish for the Smithsonian Institute, which were on exhibition in the Government Building.

Col. Lyman of Massachusetts spoke of what that state was doing in the way of fish culture, following which a discussion followed on Fish-Ways, engaged in by Mr. Reeder and Worrall of Pennsylvania, Lyman of Massachusetts, and others.

Following the discussion, Mr. Banks moved that a recess of one hour be taken by the Society, which was adopted.

On re-assembling in the afternoon, the Secretary read letters from Geo. Shepard Page, Mr. Coup of the New York Aquarium, and others. Mr. Brower offered a paper on Fish-Ways which was read.

Mr. Ward of New York City offered this Society, through W. C. Coup, the free use of rooms at the New York Aquarium for the purpose of holding meetings of the Society, which, on motion, was accepted.

Mr. Mather spoke of what was being done at the Aquarium in New York, following which a discussion on Black Bass was engaged in by all present.

Mr. Stone spoke of sending eggs of the Salmon successfully to New Zealand and Sandwich Islands.

The President invited all the members present to a dinner of the Association, at Lafayette Restaurant, when the Society adjourned to meet again at 11 o'clock to-morrow.

SECOND DAY'S MEETING.

The meeting was called to order by the President.

The Society listened to remarks from John O. Warder of North Bend, Ohio.

Mr. Milner spoke on Nomenclature.

Mr. Mather spoke of the Grayling, followed by remarks from C. J. Worrall on Fish-Ways, which was engaged in by the members present.

Dr. Robinson of Virginia, spoke of what his state was doing in the way of propagating fish.

Mr. Banks proposed the following named gentlemen as members of the Association:

Dr. C. A. Kingsbury, 1119 Walnut Street, Philadelphia.

Dr. H. C. Yarrow, Washington, D. C.

Greene Smith, Peterboro, N. Y.

Charles Hutchinson, Utica, N. Y.

Which, on vote of this Society, were duly elected members.

This Association, on motion of Seth Green, adjourned *sine die.*

M. C. EDMUNDS, *Secretary.*

WEDNESDAY'S MEETING.

The Sixth Annual Meeting of the Association convened at the N. Y. Aquarium, New York City, February 14th, 1877. The

meeting was called to order by the President, Robt. B. Roosevelt, at 2 o'clock, P. M. After the reading of the President's Address, Mr. Milner of Washington, D. C., read a paper on "Protective Legislation." A discussion followed, in which Mr. Betteman, Superintendent of Fisheries in the Netherlands, spoke of the great advantage gained in protective legislation with proper police force in Holland.

Mr. Tileston moved the election of W. C. Coup as an honorary member of this Society, which was unanimously carried.

Mr. Wilmot of Canada had on exhibition a stuffed specimen of the Salmon Wilmoti, or Ontario Salmon, which was bred from artificial propagation. He also explained his process of breeding, and the advance made by him since beginning in the work.

The President appointed as Committee on Nomination of Officers for the year, Messrs. Green, Tileston, and Evarts.

Messrs. Milner and Wilmot discussed the question of the *Salmo Fontinalis* and Sea Trout, or *Salmo Canadensis*, claiming the two fish to be identical. Concurred in by Seth Green and Mr. Blackford.

Prof. Baird spoke of the inception of the scheme to introduce California Salmon, and what had been done the past season through Mr. Milner and Mr. Stone. He spoke of results attained in the cultivation of the European Carp and Tench. Mr. Milner spoke of the Shad hatching in specific numbers the past season.

The committee on nominations reported :

For President—Robert B. Roosevelt, New York City.
For Vice-President—George S. Page, do.
For Treasurer—Eugene G. Blackford, do.
For Secretary—Barnett Phillips, Brooklyn, N. Y.
Executive Committee—H. J. Reeder, Easton, Pa.; Fred.

MATHER, New York City; ALEX. KENT, Baltimore, Md.; W. F. WITCHER, Ottawa P. O.; SETH GREEN, Rochester, N. Y.; which, on motion of Mr. Stone, were duly elected officers of the Association for the year ensuing.

Mr. Livingston Stone spoke of the California Salmon—their growth and propagation, and their shipment to New Zealand, etc. A discussion followed on the propagation of Salmon in salt water, by Messrs. Baird and Wilmot.

On motion of Mr. Blackford the Society adjourned, to meet again at 11 o'clock to-morrow.

THURSDAY'S MEETING (February 15th, 1877.)

The Society met pursuant to adjournment.

A paper was read by Mr. Mather on Fish Culture in the New York Aquaria.

Mr. Wilmot spoke of a new theory in the practice of impregnating fish eggs, claiming that impregnation was instantaneous.

A discussion followed by Messrs. Green, Milner, Mather, Stone, and Wilmot, in which no concurrent opinion was entertained by the disputants.

Mr. Phillips read a paper on Edible Fish of foreign countries, in which he compared our fish with those of other nations, extending the variety of edible fish in this country beyond the conception of our most noted connoisseurs in fish diet.

Mr. Waldheim spoke of fish culture in his country. He thought the mode of preparing fish for market in America was better than the European way; that our way of freezing was much better than their way of salting and pickling.

Mr. Hall spoke of the Adirondack region, and what the Legislature should do to protect fish in that locality.

Mr. Phillips moved that Sekizawa Alkelkio of Japan be made an honorary member of this Association. *Carried.*

Mr. Wilmot read a letter from Mr. Witcher, extending his good wishes to the Society.

The report of the Treasurer was read and adopted.

The Secretary read letters from A. P. Rockwood of Salt Lake, Utah, and from Mr. Redding of California.

Mr. Milner moved that the Association organize sections for essays and discussions on fish topics before the Association, and that a committee of three be appointed by the President to report such organization to the Society. *Adopted.*

The President appointed as the Committee, Messrs. Milner, Blackford, and Phillips.

The Committee reported that four sections be adopted, viz:

1. A Section of Methods in Fish Culture and Apparatus.
2. A Section on Fishery Laws and Fish-Ways.
3. A Section on Natural History and Aquaria.
4. A Section on Fisheries.

That the President appoint three members to each section, with power to add to their number, and when all members present have united with a section, that section shall then elect its chairman. That certain hours of each session of the Society, in the future, be voted to certain sections for the reading of essays and discussions in their special branches, and after each section has occupied their time, the meeting be given up to general discussion.

Report of the Committee adopted.

The President appointed as Committee on the sections named:

SECTION 1. Mr. S. Green, Mr. B. B. Porter, Mr. S. Wilmot. } *Methods in Fish Culture, etc.*

SECTION 2. Mr. C. B. Evarts, Mr. L. Stone, Mr. T. B. Ferguson. } *Fishery Laws and Fish-Ways.*

SECTION 3. Mr. J. W. Milner,
Mr. F. Mather,
Mr. C. H. Hallock. } *Natural History, etc.*

SECTION 4. Mr. E. G. Blackford,
Mr. B. Phillips,
Mr. M. C. Edmunds. } *Fisheries.*

Mr. Hallock offered the following resolution:

Whereas, Through the influence of the American Fish Culturists' Association, attention was first directed to the necessity of establishing an American Aquarium for the collection and study of American fish; and

Whereas, Through the earnest effort of individual members, and the active and substantial co-operation of Messrs. Coup, Reiche, Blackford, Mather, and others, the present creditable Aquarium, as we now find it, was established; and

Whereas, By fortuitous circumstances, the present session of this Association has been held at the Aquarium buildings as above, be it therefore

Resolved, That there is no place so suitable for the annual meetings of this Association as the Aquarium, offering, as it does, unusual opportunity for study and comparison of specimens and species, and therefore, that hereafter the sessions of this body be held at the Aquarium, as not only advantageous to itself, but as a proper recognition of the enterprise and efforts of the gentlemen who have established and now superintend it.

Resolved, That the Aquarium be recommended to the public as well worthy of its patronage.

The resolution was adopted unanimously.

Messrs. Mather and Porter spoke of carrying live fish in snow.

Moved, That the thanks of this Society be tendered to W. F. Witcher for his interest in its behalf. *Carried.*

Dr. Edmunds offered the following resolution:

Resolved, That the President appoint two members of this Association to prepare for our next meeting suitable memorials on the death of B. F. Bowles and W. F. Parker.

The President appointed as said committee Mr. Edmunds and Mr. Stone.

Moved, That the Society purchase, through its Treasurer and Executive Committee, a book-case, to be placed in the Aquarium rooms, in which to keep reports and donations to the Society. *Adopted.*

On motion of Mr. Phillips the Society adjourned to meet in annual session on the second Wednesday in February, 1878.

M. C. EDMUNDS,

Secretary.

Centennial Meeting.

Centennial Grounds, Philadelphia,

Friday, October 6th, 1876.

A special session of the American Fish Culturists' Association was held in Judges' Hall, Centennial Exhibition Grounds. Among those present participating in the meeting were the following persons:

Prof. Spencer F. Baird, U. S. Fish Commissioner; Robert B. Roosevelt, President of American Fish Culturists' Association; M. E. Edmunds, Weston, Vt.; T. B. Ferguson, Baltimore, Md.; A. A. Anderson, Bloomsbury, N. J.; Seth Green, Rochester, N. Y.; Fred. Mather, Honeoye Falls, N. Y.; H. H. Thomas, Randolph, N. Y.; T. C. Banks, New York; J. D. Bremer, Pennsylvania; A. Bell Malcolmsen, Jr., New York; Livingston Stone, California; E. G. Blackford, New York; William Goldsmith, Vermont; Sekizawa Alkelkio, Imperial Japanese Commissioner.

Hon. R. B. Roosevelt, President of the Association, delivered the opening address.

Gentlemen: Some fifteen or more years ago I wrote a book upon the Sporting Fishes of North America, and in it devoted some attention to the matter of fish culture. At that time but little was known upon the subject, the investigations of Gehin and Reiny had but lately been given to the world. Ainsworth was not known to the public, and Seth Green, although working away on his own account, had yet made no sign. The only American work on the subject was the pamphlet of Dr. Garlick.

However, as is the case with most of the great inventions, human attention was directed to the same subject much in the same direction at the same time in widely-separated sections of the world. Reiny, Green, and Ainsworth were practically at the same point, and had not Reiny succeeded when he did, the others would not have been much later. In my own writings, which were intended to bring the importance of the subject to general consideration, and which contained all that was known at the time, now that I look at them from our present advanced standpoint, I find many errors that deeper investigation has disclosed. Among these short-comings, however, there is one sentence which this meeting makes so conspicuously prophetic, that I quote it as confirmation of the reasonableness of our convictions in the past, and the encouragement that our present higher anticipations may yet be fully realized: "Our first farmers chopped down the forest and shade trees, took crop after crop of the same kind from the land, exhausted the soil and made bare the country; they hunted and fished, destroying first the wild animals, then the birds, and finally the fish, till in many places these ceased utterly from off the face of the earth, and then, when they had finished their work, that race of gentlemen moved West to renew the same course of destruction. After them came the restorers; they manured the land, left it fallow, put in practice the rotation of crops, planted shade and fruit trees, discovered that birds were useful in destroying insects and worms, and passed laws to protect them where they were not utterly extinct, as with the pinnated grouse of Pennsylvania and Long Island, and will, I predict, ere long, restock the streams, rivers, and ponds with the best fish that once inhabited them." When fish culture was first attempted in this country, our fisheries of all kinds had deteriorated, till in many places they were on the point of extinction, and in fact, had been

destroyed in some instances, as with the salmon fisheries in Lake Ontario,. and the northern portion of the State of New York. The Middle and Eastern States had been the first to suffer; in New England the salmon had diminished greatly in the once prolific streams of Maine, and had disappeared from the Connecticut River; shad, alewives, and herring, were growing scarcer yearly, while the cod fisheries had been driven from our coasts to the banks of New Foundland. In the Hudson River the shad fisheries were being abandoned at many stations. In the Delaware the yield has been enormously reduced, and destruction was impending over the James and other more southerly rivers. Smaller streams in some localities had been left utterly bare of fish, and everywhere the most delicate and attractive species; the brook-trout had diminished to little more than a memory of the past. The time had arrived when, if our fish supply was to be saved at all, it had to be looked after.

The first attempts at fish culture in this country were met with ridicule and opposition, but nothing could deter the enthusiasts who had taken it in charge. The shrewdest of these perceived it not merely an immense benefit to the country at large, but a source of private profit. Trout breeding was commenced as a commercial enterprise, and discoveries were soon made which placed America at the very head of fish culture. Seth Green, at his private establishment at Caledonia, discovered the principle of dry impregnation, but as he kept the process a secret, it was not generally known till it was re-discovered abroad and came back to us from Russia. He next invented his shad hatching-box, which has been so universally employed since. Ainsworth substituted screens for troughs in trout hatching, and Holton improved on the idea in his box with the water rising from below instead of falling from above—an invention specially adapted to the breeding of white-fish. All

sorts of fish were tried, from the bony fish of our coast to the pork livers of the West, and innumerable matters of detail were changed for the better, while many doubtful questions were settled.

In Europe, all that had been effected up to that time—and there has not been much advance since—was the cultivation of trout and salmon, and the building of salmon-passes. The latter has been of vast importance to them ; and with no other aid than proper legislation has restored many rivers which had been ruined by artificial obstructions, and greatly improved the yield of others where there had always been natural obstructions. The yield of any river, other things being equal, is dependent upon the extent of the spawning-ground, and the more that can be enlarged the greater will be the supply. It often happens that a single fall bars the salmon from the upper waters, and when this is overcome, hundreds of miles may be added to the range of the fish. Our rivers are probably more generally obstructed by artificial dams than those of Europe, so much that in some States—I may instance that of New York—little attention has been devoted to the erection of fish-passes. In the New England States, however, much energy, skill, and ingenuity has been displayed in giving salmon, shad, and herring an easy and convenient method of overcoming obstructions which man or nature had placed in their way. Good has already resulted, but greater benefit is to be expected when time shall have accustomed the fish to their new habitat. One incidental benefit has been derived from this work : the inhabitants along the banks of the inland streams are beginning to understand their rights, and appreciate the damage and wrong which were done them when an impassible barrier was placed between them and a supply of food which had hitherto, unsought, presented itself at their very doors. I find it exceedingly difficult to obtain reliable statistics

of the extent of the domestic yield of fish. The cod and mackerel of the northern fisheries, which are imported, are recorded in the returns of the Custom-houses, but the produce of our shore and stream fisheries, and even of our great lakes, remains a matter of guesswork instead of calculation. Nevertheless, any one familar with the subject, who knows something of the diminution in the past, and has seen the improvement here and there effected by fish-ways in the present, can positively assert that the destruction of fish by mill-dams amounts yearly to many millions of dollars. We pay Canada alone a million annually for the privilege of eating salmon which once abounded in our waters, and thousands of miles of shore fisheries have been cut off in our land by dams. That these obstructions can be overcome is being made clearer year by year; there have been mistakes in construction, errors of opinion as to the habits and capacities of different species of the migratory fishes, but fish-ladders are now constructed which meet all requisites, and which not only salmon, but shad, herring, and alewives, have ascended, although shad are exceedingly timid, and not to be tempted where their distrust is aroused. As conspicuous instances of the effect of opening additional spawning-ground, may be mentioned the Damariscotta River, in Maine, to the upper waters of which alewives were admitted in 1806, and which has yielded millions yearly since. And in Ireland, the river Corrib, in which a fish-pass was erected in 1853, the yield of salmon being thereby increased from sixteen hundred to over twenty thousand. Many other instances could be presented, but these are enough to prove that similar results may be anticipated from our later efforts.

In America, advance has been made not alone in the mechanical appliances of Fish Culture, but in the varieties of species to which it has been adapted. Abroad, as I have said, attention was paid mainly to the salmon, which was the most valuable species,

and to the trout. Since then, attempts have been made to hatch carp, but no fish having the eggs enveloped in a gelatinous substance has been managed as successfully as those whose eggs are free. With us we hatch trout, salmon, land-locked salmon, salmon-trout, grayling, whitefish, while with shad enormous results have been obtained. It is nothing unusual for individual states to hatch millions of each of these varieties, while of shad as many as fifty millions have been produced at a single station. In practical results I believe that our efforts will compare favorably with those of any country, many lakes and streams which had been depleted by overfishing and disregard of reasonable protection, have been restored to productiveness, better varieties of fish have been substituted in localities occupied by worthless or coarser ones, the prices of fish-food had been conspicuously reduced, while in many instances fisheries which were being abandoned have been made once more remunerative to their owners. Although all the hopes of the enthusiasts in fish culture have not been realized, this is a fair showing for the past. The most serious difficulty encountered has been the need of proper legislation. The eel-weirs still stand in most of our streams, destroying, along with the eels they legitimately capture, a mass of young fry of valuable species which often have been laboriously bred to stock these streams; dams are still being erected, unseasonable fishing is still allowed, and scarcely an effort has been made to limit the ruinous effects of pound-nets—those most destructive of fishing appliances. We need legislation, and can only obtain it by instructing the people and explaining its necessity and the advantages it will confer upon the entire country.

In addition to the varieties mentioned, successful attempts have been made with other kinds. The alewife, striped-bass, and sturgeon have been manipulated and will soon be included

in our permanent list; and the oyster fisheries, while receiving careful supervision from the Commissioners in several states, have become in private hands vastly profitable. Many most interesting experiments have been made; sea fishes have been confined in fresh waters, fresh-water fishes allowed to visit the ocean, shad have been carried to Michigan and to the head waters of the Mississippi River, and even to the Pacific coast where they had heretofore no existence. Black bass have been brought East and neutralized in the lakes and ponds of New England and the Middle States; while salmon, trout, and white-fish have been distributed throughout the great West. California salmon have been placed in the Delaware and the Hudson, and white-fish sent to California. Already nineteen states of the Union, one Territory, and the United States, have appointed Fishery Commissioners, who have displayed great enthusiasm and commendable energy; and attention is being paid to fish culture in all the more advanced portions of our country which nature has peculiarly adapted to it. In America are to be found the largest lakes, constituting almost inland seas, the longest rivers, the greatest net-work of streams, and the most remarkable variety of water in the world; while to fill these with food we have species of fish the most productive and the best suited to artificial manipulation. The shad produces its eight or ten thousand eggs to each pound of weight; the black bass guards its young from danger till they can protect themselves, and the California salmon will endure a warmth of temperature which would destroy the salmon of Canada and Europe. Of water we have all sorts—clear, confined, turbulent, stagnant, extended, and limited; the purling brook, the stately river, the vast lake, varying in temperature at all degrees, from the hot springs of the West, to the mountain trout-stream and the icy spring—even underground ponds and streams inhabited by eyeless fish. There

is to be found also every kind of bottom and spawning-ground and abundant food. It has been shown by the able and scientific labors of the United States Commissioner, Mr. Baird, that there need be no fear of scarcity of fish food either in the ocean or in our great lakes, and that both waters contain much of the same sort. We have only to take advantage of these opportunities. This is the national centennial; fish culture has existed only a few years; what will be its condition at its centennial the most enthusiastic can hardly conceive. We have passed through doubt and uncertainty; errors were inevitable. A new science was being born into the world, and mistakes were unquestionably accompanying it, but the clear light is visible at last. We now know where we are, and although an endless vista lies before us, we are enabled to tread it with firm and intelligent steps. The vast boon to the people promised by this discovery of abundant fish and cheap food is now assured. There need be no fear for the future, and in much less than a hundred years the waters of America will teem with food for the poor and hungry, which all may come and take. [Applause.]

Mr. Barnett Phillips of Brooklyn, N. Y., addressed the meeting in detail upon the objects of interest observed by him in Group V., embracing exhibits of fish, methods of fish culture, appliances for fish catching, etc.

I feel somewhat flattered by the call you have made on me to describe some of the objects I may have seen in Group V. I must declare my ability to do so except in the most cursory way. If our two days' session were to extend over two months, perhaps by constant talking I might accomplish this object. All I can hope to do is to run over in a desultory and perhaps unsatisfactory manner the character of the group, with its various ramifications into branches or classes.

Now, when committees, juries, or experts are brought together for matters practical, scientific, ecclesiastical, or commercial, the best general work or result is brought about if each man is allowed to follow his own bent. In fact, men, by their own natural impulses, slide into peculiar grooves. So, in a body of men acting together, one person has the brains and does the *thinking*, another has the legs and does the *walking;* and I assure you that individuals so blessed have ample scope for pedestrianism in this exhibition, while another who has the mouth does the talking. I would like to draw here your attention to this fact. In this enormous icthyc show, I am inclined to think that the mouth was comparatively useless—at least in what is sometimes regarded as its noblest function. The mouths having to do with Group V., I suppose, have talked but sparingly, and for the best of reasons. It was because the mouths of the judges of Group V. were *full*—not of poetic sentiment nor of dry scientific names, but full of fish. You may depend upon it that there was a great deal of steady tasting. If it is permitted to man, in his ordinary experience, to taste a good deal, at this exhibition the most extraordinary opportunities were allowed him. If we run through the ordinary alphabet of tastes, calling for instance A the savor of salted cod, or B the flavor of smoked herring, it must have required quite the perfection of gustatory grammar to understand squid in its original ink-sauce, coming from Spain, or to construe or digest dried skark-fins from China. Certain combinations may no doubt have been pleasant to the judges, though I am inclined to think that occasionally their impressions might have been painful. Of course I do not mean to say that the judges of Group V. were martyrs in the cause. but as icthyophagists, eating ploddingly and conscientiously through the fish of twenty-seven countries, in a continuous kind of repast, extending over a

couple of months, their task, I fancy, was by no means a light one.

I have here a list of the fish products derived from the various seas, rivers, and lakes of the world, which have been tasted. It is, in fact, an edible fish-chart :

Countries.—Austria, Argentine Republic, Bahama, Bermuda, Brazil, Canada, China, Chili, Cape of Good Hope, England, France, Germany, Italy, Japan, Liberia, Netherlands, N. S. Wales, Norway, Portugal, Russia, Spain, Turkey, Tasmania, United States, British Columbia.

Fish.—Anchovies, Bream, Barbel, Cavear, Carp, Cray-fish, Clams, Cod, Cockle, Cusk, Eels, Conger-eels, Flounders, Hake, Haddock, Halibut, Herring, Lamprey, Lanquet, Ling, Lobster, Mackerel, Mullet, Mussel, Menhaden, Ox-fish, Oyster, Oolachans, Pilchard, Pike, Pollock, Rouget, Roach, Sea-Snails, Sardines, Salmon, Shad, Shark, Skate, Sprat, Squid, Sole, Sword-fish, Sturgeon, Shrimp, Turtle, Turbot, Tunny, White-fish Whiting,—fifty fish, and further supplemented by unknown fish.

Now it must be remembered that in a great number of cases the same fish was prepared by different exhibitors in various countries in many strange ways. For instance, take eels. They came from Comancho, the famous eelery of Italy, and from Spain, Portugal, Sweden, Russia, and the United States. Of Salmon there were 29 exhibits. This latter fact showing, I suppose, that the Whitefish, Salmon, or the family of the *Salmonidæ*, feed more human beings than any other fish! I suppose, then, that at times the judges might have been both palled and appalled with all this richness; but I am pleased to state they still live, two of them here present, and the news has reached them that the gentlemen from Norway, Mr. Joak Andersen, has arrived at his home in Aalesund in the best of health. With this slight and, I trust, impressive introduction,

I cannot presume to give you anything more than the lighter idea of Group V., which treated principally of fish, the products derived from them, with the apparatus used in catching them. For more particular information as to the divisions of the group, I would direct your attention to Mr. G. Brown Goode's most careful classification of the collection to illustrate the animal resources of the United States. Group V. was split up into nine classes, beginning with No. 641, and ending with No. 649.

No. 640 was "Marine animals, seals, cetaceans, and specimens living in aquaria, or stuffed, salted, or otherwise preserved." I must here refer you to the wonderful display made by the Smithsonian Institution in the Government Building. It can be safely stated that before this Centennial year there has never been brought together so magnificent a collection. Its thoroughness and practical usefulness quite manifest, and allow me to explain how. As we are not quite well posted in Chinese fish, it became the duty of a person attached to the group to endeavor to find out what fish China used principally as food. Thanks to Mr. Knight, the Chinese Commissioner, the person whose business it was to grope into the Chinese fish darkness, was provided with an intelligent Chinese interpreter, and he was backed up by a learned Chinaman, undoubtedly a savant, because this latter person was to write a book or maybe deliver only speeches on the Exhibition in Chinese for the benefit of Chinamen. I think rather an unprofitable evening was spent between this American person and the Chinamen, though it was not uninteresting. But China fish was a closed book. It was apparent that in China there must be twenty different names for the same fish, in which peculiarity they do not differ from our own people. At last a happy thought struck the person who wanted "to know, you know." Next day he took his two Chinamen among the plaster casts of fish in the Goverment

Building, and no end of useful information was readily obtainable. Both Chinamen fairly gushed and pointed right and left at fish they were at home with, and opened their eyes in wonder at such nondescripts as were strange to them. In fact, this collection of plaster casts of fish, supplemented by the photographs, is like a Kindergarten, where object-teaching is made intelligible to the largest children, scientific or otherwise. I must recall here, too, the very complete collections of fish preserved in alcohol, coming from Sweden and Norway, which may be found in Agricultural Hall.

Of class 641, "Fishes Living or Preserved."—If I cannot refer with pride to the aquaria, which, for very good reasons, were not as extensive or as well filled as Mr. Mather would have wished, or as Mr. Mather's great acquaintance with this subject deserved, it has taught us this lesson: That aquaria, like menageries or zoological collections, require special facilities, and must be constructed solely for the purposes intended. I can, however, point to the refrigerators stocked by Mr. Eugene G. Blackford of New York, as one of the prominent features of Group V., the worthy Treasurer of our Association having poured out there during the whole of the Exhibition the entire riches almost of the United States in edible fish. At the present moment I believe there are no less than 180 in the refrigerators. The high character of the award, which I understand the judges have accorded him, may, I believe, be considered as a merited compliment to the American Fish Culturists' Association.

No. 642, "Pickled Fish and Parts of Fish," I have already alluded to. If I was merely to endeavor to describe them in these two days' sessions, hardly more could be done than to open, figuratively, the innumerable cans, jars, casks, tubs, or barrels, which contain them. To recount how they looked, tasted, or smelled, might be but to offer you a Barmecidian feast. Some

of them, in imagination, might make your mouths water; some, if actually experimented upon, might have quite a contrary effect. I trust as to the crucial test, for "the proof of the pudding is the eating of it," that the gentlemen here present will have ample opportunity of forming their own opinion at the dinner to be given to-day at the Lafayette restaurant. I may say that since there are curious wines which connoisseurs admire, so are there curious fish. I am led to suppose that in making their awards as to preparations of fish as food, the judges very wisely did not confine themselves to any pent-up Utica of taste. White bait at Greenwich is good, and, undoubtedly, seal meat at Omenack, in Greenland, is excellent. If preparations of fish from Sweden, Norway, or from Spain or Portugal, did not suit American palates, such might have been admirably adapted to the wants of more northern or southern climes. *De gustibus non est disputandum*, I suppose, was taken in its broadest latitude. Now, there were those Chinese shark-fins, certainly not savory as to smell, still we have the assurance from the Chinese Commissioner, that made into a soup with barley, shark-fins are unequalled as stock. I think, too, shark eating in the United States has a representative here who has declared that portions of a young shark are excellent as food. Of class 643, "Crustaceans, Echinodeons, etc.," the samples were numerous. Of class 644, "Mollusks, Oysters, Clams, etc." there were innumerable specimens. In class 646, which includes ising-glass and sounds, some very beautiful preparations may be seen in Agricultural Hall and in the Brewers' Hall—American ising-glass from the hake being used to a large extent to clear our lager beer—the superb specimens of ising-glass exhibited by Russia, all worthy of notice. In class 647 are "Instruments of Fishing;" the biggest show the world has ever seen is full of them. From the huge drag-net used by the Dutchman on his

broad-breasted lugger as he thrashes through the ugly North Sea and sweeps up the turbot, to the delicate silken net, the plaything of the Japanese lady, all were found at the Exhibition. These nets alone were a study. In Norway and Sweden a curious example may be found of usages now in vogue which have descended from the stone and bone age, or from prehistoric times. For here may be seen nets weighted with stones, each one with a hole drilled patiently through it, and nets held below the water by means of split sheep-bones. If, however, such primitive methods still exist in northern countries, perhaps due to the poverty of the fishermen, still in Sweden and Norway engines for the capture of fish may be seen admirably constructed. If there be nets floated with the core of their fir-cones, they use, too, hollow spheres of glass. In trawls, such as serve for catching cod and haddock, certain systems of arranging the hooks, and methods of carrying the line, are worthy of being copied by our Gloucester and Nantucket fishermen. In both the coarser and finer fishing-lines—tackle for business or pleasure—the exhibitions were superb. Dilettanti fishermen in the United States would be hard to please had they to look beyond the contents of the cases in the Government Building, or in Agricultural or in Main Hall. As to rods, such delicate conceptions, so light, yet so strong and elastic, one could hardly imagine could be constructed. In reels, made in the most ingenious manner, no end of talent and ingenuity has been lavished. In fact it looks as if a fisherman was naturally inventive. Perhaps when trout do not rise, he broods over some ideal reel, and his dreams find actual shape. In class 648, "Fish Culture," a subject more particularly within the scope of this Association, the exhibition was a fairly good one. Their simplicity of form, and consequent cheapness of construction, prevents in a measure such an exhibition from having the

startling claims to attention as a Fresnel lighthouse might call for. Excellent varieties of hatching apparatus may be seen in the Government Building, with the various utensils used in the transportation of fish, some of the latter being indeed historically famous. The collection of models of Fish-Ways are wonderfully complete, and may afford one ample means of study and comparison. I would call your attention to the charming miniature fish hatching-house in the Maryland State Building, planned by the Fish Commissioner from Maryland, and also to the process of hatching California salmon, now actually going on in the same building.

I should endeavor, before concluding this exceedingly rapid and necessarily imperfect sketch of Group V., to give some deductions in regard to its general character. I must declare, then, that as far as the actual fishing or catching goes, we have in America very little, if anything, to learn. Our nets, lines hooks, and apparatus, generally, are exceedingly well made and of the best material. As to the ingenuity displayed, the best proof of the excellence of the apparatus is to be found in the diminishing quantity of the fish.

Without our being then the least pretentious, we are to be taught but very little from abroad as to how fish are caught in the cheapest and most expeditious way. Here and there, occasionally, some things seemed to be novel, as derived from another country, but a more careful study of such devices showed that the methods had been employed in the United States, and either given up or amended.

In fact, the United States is sending fishing material abroad, where it finds an increasing demand, due to its cheapness and excellence. As to "Fish as Food"—class 642—other deductions, I think, could be made, and perhaps not as flattering. Certain methods of preparing cod, haddock, and ling, employed in

Norway, where fish are dried and cured without salt, present the greatest advantages. In the same bulk or weight you have all food. Perhaps the climate of Norway would allow the fish to be prepared in this peculiar way, which would not be possible in the United States or in Canada. That the fish dry-cured were excellent, and will stand over-heated weather is quite manifest, as may be seen by going to the very fine Norwegian exhibit in Agricultural Hall. Both Spain and Portugal put up crude fish of the cheaper varieties in admirable ways, worthy of imitation.

As to the finer preparations of fish, such as Sweden and Norway send into the Northern markets, and are called *delicatessen*, we have ever so much to learn from them. I need not call your attention to the admirable French preparations of fish, which excel those of any other country ; for French sardines, like French bonnets, go all over the world. As to our own canned preparations, they are excellent in their way, but they are wanting in variety. They are monotonous. It may be said that what we put up meets the demand, but there is no doubt that if we got out of the stereotyped forms of preparation, such as are represented by canned salmon, and tried our hand at other things or methods, our success would be greater. We have innumerable fish on our coast, now neglected, which ought to be cared for, and which, if properly arranged, would find eager purchasers all over the world. Of course an opening has been made in this direction, and our American canners are putting up good preparations in oil, which even find a market as far off as Russia. Nevertheless we are still somewhat wanting in the art and delicacy of the thing. Our method of canning salmon, the natural one, is entirely original, and has assumed marvellous proportions. It is on the Pacific side that this immense fish harvest is garnered, and I may state from careful statistics that

the Columbia River alone yields more salmon, four times over, than does the whole of England, Scotland, Ireland, or Wales.

Fearing to tax your patience, I shall now close, repeating that no one in a casual way, without careful study, could imagine the vast number of objects included within this group, and what a fund of information and instruction is to be found in it.

This grand exhibition, then, in its widest sense, being founded on the broad and great principle of the exchange of thought, that fractional portion represented of Group V. may have been of great advantage to other countries in affording them ample opportunities to study our methods of fish capture, while in exchange we may take from them many approved ways of preparing fish food.

As to fish culture, there are so many distinguished gentlemen here present, men whose reputations are known all over the world, that it would be worse than presumptuous on my part to speak about a work of which they are scientifically and practically the great masters, only I think that they will agree with me in coming to this conclusion, that in fish culture we in the United States and in Canada have performed greater feats and have arrived at broader, larger, and, above all, more useful results than in the Old World. If fish culture was discovered in Europe, it is here that fish culture has taken its most practical development.

Prof. James W. Milner, Assistant United States Fish Commissioner, in special charge of the work for Shad Hatching, reported as follows:

Mr. Chairman: The collections of the United States National Museum in the Government Building of the International Exhibition, or, as our countrymen have chosen to term it, "Centennial Exhibition," relating to the fisheries, are arranged under the following classifications:

SECTION A. ANIMALS BENEFICIAL OR INJURIOUS TO MAN.

I. Pinnepedia: Seals, etc.
II. Sirenia: Sea Cows (manatees, etc.).
III. Cete: Whales, porpoises, dolphins.
IV. Testudinata: Tortoises, turtles, etc.
V. Fishes: (Fishes proper.)
VI. Elasmobranchiates: Sharks and rays.
VII. Marsipobranchiates: Lampreys, hags.
VIII. Leptocardians: Amphioxus or lancelet.
IV. Arthropods: Crustaceans (crabs, etc.).
X. Worms: Annelids, scolecids.
XI. Mollusks: Cuttlefishes, clams, oysters, snails, etc.
XII. Radiates: Star-fishes, polyps, etc.
XIII. Protogoans and foraminifers.

SECTION B. MEANS OF PURSUIT AND CAPTURE.

I. Hand implements: clubs, knives, axes, spears, etc.
II. Implements for seizure of object: scoops, gaff-hooks, tongs, etc.
III. Missiles: spears, harpoons, bows and arrows, firearms.
IV. Baited hooks: angling tackle.
V. Nets: entangling nets, surrounding nets.
VI. Traps: fish-pounds weires and traps.
VII. Apparatus for wholesale destruction: poisons, torpedoes.
VIII. Hunting animals: Cormorants.
IX. Decoys: lures, etc.
X. Pursuit—its method and appliances: camp outfit, sboat, live baits, personal equipments.

Section C. Methods of Preparation.

I. Preparation and preservation of food: living, freezing, drying, canning, and pickling.

II. Manufacture of textile fabrics from whalebone.*

III. Preparation of the skin and its appendages: sturgeon skins, skins of cetaceans (porpoises, etc.).

IV. Preparation of the hard tissues: fish-scale work, preparation of whalebone, preparation of tortoise-shell, preparation of nacre, preparation of coral.

V. Preparation of oils and gelatines: whale-oils, fish-oils, and ising-glass.

VI. Preparation of drugs and chemical products: murexides, flake-white from fish-scales.

VII. Preparation of fertilizers: fish fertilizers.

VIII. Preparation of limes: from shells.

IX. Preparation of the animal for scientific uses: wet preparations, skeletons, models, stuffed specimens, photographs, drawings, and colored sketches.

Section D. Animal Products and their Applications.

I. Foods: fresh, dried, and smoked, salted, canned, and pickled, gelating; baits and food for other animals.

II. Clothing: leather of porpoise skins, sturgeons, furs of seals, textile fabrics of whalebone.

III. Materials employed in the arts and manufactures: baleen, tortoise-shell, scales, pearl, shells, coral, leather, gelatine and ising-glass, flexible materials from mullusks, sponges, oils and fats, coloring materials, chemical products, and agents employed in arts and medicines; fertilizers, limes.

* The classification employed was scientific, and made the natural history system its basis. In applying it to the fisheries in our reference to the subject we shall embrace everything pertaining to the fisheries as the term is ordinarily used, including the whales, seals, turtles, corals, etc.

SECTION E. PROTECTION AND CULTURE OF USEFUL ANIMALS.

I. Investigation: methods of United States Fish Commission.

II. Protection: preservation of fish, care of whales, seals, fish, etc., in aquaria, enemies of useful animals.

III. Propagation: mink culture, terrapin culture, frog culture, fish culture, leech culture, and oyster culture. The objects displayed under this classification included: specimens of natural history representing seals, whales, turtles; food fishes that are in general use as food, and such as would not ordinarily be deemed edible; animals which prey upon fishes; and invertebrates which constitute the food of man and of fishes; star-fishes, corals, and sponges; implements of capture, including an almost exhaustive series under each division of this section; nets of all descriptions; boats used in fishing; angling tackle and traps.

FISH PREPARATIONS AND PRODUCTS.

Under the class of natural history there are five series of stuffed specimens, colored plaster casts, and photographs. The fact that alcoholic specimens are unattractive and rather unsightly, induced Prof. Baird, some years ago, to employ in moulding fishes and animals an expert who had attained some success in the collection situated in the Crystal Palace, London. The color sketches are first made from fresh specimens; the mould is also made from fresh specimens, and afterwards the cast is made. An accomplished colorist paints the cast from the color sketch, and they are then neatly mounted in a frame with black-walnut mouldings.

The list of casts includes about three hundred species, represented by some five hundred casts. From the same original

specimens a negative was taken, from which usually several prints were made. These are also neatly framed, and now number some seven hundred. The fishes from which these representations were made were collected on the Atlantic coast, principally by the United States Fish Commission at different stations—Eastport, Portland, Me., Noank, Conn., and Wood Hole, Mass. The collections from the great lakes and the Ohio River were by myself, under the direction of the United States Fish Commissioner; and those from the Pacific coast principally by Mr. Livingston Stone, who has charge of the propagating interests of the United States on the Pacific slope. Very many specimens have also been received from the numerous correspondents of the United States Fish Commissioner. The fish products and preparations were largely procured under the direction of Mr. E. G. Blackford of New York city. The implements and boats were obtained directly by Prof. Baird through correspondence with a very large number of people in all parts of the United States.

The excellent system and method in the arrangement of the collections is due to Mr. G. Brown Goode of the Smithsonian Institution. In the latter class, Section E., the more important articles to which attention may be called as having a tendency to improved methods in the culture of fishes, may be mentioned the new tray-hatching apparatus, the basket-hatching apparatus for eggs in bulk, floating boxes, models of fish-ways and aquaria.

The presiding officer having invited reports upon the fish interests of their respective localities from the representatives of this and other States, to be made by members present, Prof. B. Lyman of Massachusetts, responded.

Prof. LYMAN of Massachusetts said:

MR. CHAIRMAN: I do not know that I have any report to make that would be of special interest. I may say that it has given me great pleasure to see such an extraordinary collection as the one which has been reported upon by our worthy Secretary, Mr. Phillips. So far as the comparatively small State of Massachusetts is concerned, I would say that we are now, as we have been for many years, trying to get a fish-way that will carry shad over a big dam. We have had a partial success, and hope to be more completely successful. I mention this more particularly for the purpose of calling the attention of gentlemen here present to this subject, in the hope that when they go to their homes in widely-separated parts of the country, they may be led to reflect upon it, particularly those of them who live near shad-streams, and may aid in throwing new light upon the most effective way of getting shad over a high dam. The difficulty of course—and it is a very great one—lies in the fact that the shad usually inhabit streams somewhat wide and somewhat deep. In saying "somewhat," I mean to speak of streams occupied by them as compared with streams occupied by the salmon and other fish. The consequence is they are very loth to enter into a shallow or narrow stream of water; and to induce them to enter resort must be had, I think, to an arrangement similar to that of a weir, by which they may be led from the main body of a stream into a place that grows gradually more narrow, until at last their noses strike against the descending stream from the fish-way itself. So far as I know, the fact has appeared that when they are once in the fish-way there is no trouble about their going over. They have gone over in considerable quantities at Holyoke, and also to a certain number at Lawrence, but the trouble is to get them into the bottom of the fish-way.

Another subject, and one which I hope will attract general attention among our fish culturists, is that of obtaining information upon which to base the passage of proper laws concerning the regulation of our tide-water fisheries, if you choose to call them such. You know very well, Mr. Chairman, that when we attempt to make any laws for the protection of those of the fishes that seem to need protection, we are always met by an immense mass of sworn testimony from the owners of pounds, and others interested in that branch of industry, to show that these pounds are not destructive, and do not tend to lessen the number of fish. The only way to come at the truth of the matter would seem to be to cause a series of observations to be made. This has been done to a very great extent already by the admirable investigations of the United States Commission, under Prof. Baird, and the previous investigations by the Massachusetts Commission. But we still lack a large amount of specific information. When we shall have secured the information upon which we can show how many fish may be taken without diminishing the annual crop, and when we know the facts as to the migrations of each fish, then we shall be prepared to go before a legislature and show that more have been taken than should have been taken, in view of what should have been left for seed for the next year. When you put your petition in that form, you can get a law passed that will be a satisfactory one, but, until you do that, you cannot get such a law.

These are two subjects which have much interested us in Massachusetts, and they are those which must interest all the States—the inland States, to a greater or less extent, as well as the others. I have ventured to call the attention of my colleagues to these points, so that we may, with the least possible delay, acquire all the information which will enable us to

accomplish these very desirable ends; for I think that, if we can establish the law of supply and demand, of increase and of decrease of our estuary fishes, each species for itself, we shall accomplish the greatest result that has ever been accomplished in fish culture. Of that I have no doubt. It has never been done in Europe. The great investigation which was undertaken in England in regard to the fisheries of that kingdom, had upon the Board appointed for that purpose no less a man than Mr. Huxley, and had also Mr. Shaw Lefevre, a well-known Member of Parliament, and a gentleman of high attainments, and their report was published in very voluminous form. And yet I say it boldly when I say that the French were quite right when they declared that the information thus acquired was utterly worthless, one way or the other. The manner in which it was acquired made it utterly worthless. The gentlemen appointed to make the investigation went to the different sea-port towns of the United Kingdom, and they there took the testimony of the fishermen. Now, the fishermen are divided into two opposite parties—what we call "the crawlers," or drag-net men, and the hook-and-line men, and each hated the other. The consequence was that "the crawlers" swore up and down in one direction, and the hook-and-line men in the other, the testimony of either side being thus made utterly valueless. Their bread depended on their method of fishing, the support of their wives and families depended on it; and the consequence was that each party swore to its own notions on the subject. Now, if, instead of pursuing that method of investigation, we could go and look for ourselves, as Prof. Baird has already done for himself, and as has been done in other directions to a limited extent, I say we would obtain a mass of information in regard to our coast fisheries greater than has been obtained in any way heretofore.

Hon. H. J. Reeder, Fish Commissioner of Pennsylvania, said:

Mr. Chairman and Gentlemen: I must ask you to excuse me from making any remarks in reference to this subject to-day, as I am suffering from a severe indisposition, and it is only at the sacrifice of my personal comfort and convenience that I am able to be here at all. I want simply to make one remark in connection with the subject that was touched upon by Prof. Lyman in speaking of Fish-Ways. The difficulty is in perfecting a fish-way which will successfully carry shad over a high dam. We in Pennsylvania claim that we have succeeded in building a fish-way which is successful in affording a means of transit for shad over a low dam. We have not succeeded to a very great extent with respect to a high dam, nor do I believe that any fish-way would ever succeed to a very great extent unless the very proposition suggested by Prof. Lyman were adopted, namely: a means of leading the shad into the fish-way by an arrangement of the weir. We have discussed the matter in our Commission very thoroughly. We have never tried the experiment, for the reason that it is an exceedingly expensive operation. We have never had the opportunity of testing the Pennsylvania weir until this year, when the dam, in which it was erected, was repaired in those parts in which breaks had been made by the spring floods, and ice carried down by the torrents. This year the shad passed above our dam and most certainly have gone through the fish-way to the number of five thousand; that is, we know of five thousand shad that were caught this year above the Columbia dam, in which our fish-way was erected. The supposition is that not more than twenty per cent. of the entire shad that effected a transit over our dam, by means of the fish-way, were caught by the fishermen. We are warranted consequently in deducting,

from the amount of fish caught, the fact that the number of fish that passed over the dam, using the fish-way as a means of passage, was in the neighborhood of twenty or thirty thousand. The extreme timidity of the shad is one of the difficulties with which any person undertaking the erection of a fish-way has to contend. And I believe that that is the source of difficulty with regard to all our fish-ways, that the shad are afraid to attempt the ascent. The descent in our fish-way, by reason of its very great length—one hundred and twenty feet—is so slight, and the current therefore so slow, that men have been known to pole a canoe up the descent for some distance.

Col. James Worrall of Pennsylvania gave some information in regard to the fish-ways of that State. He stated that the different inventions of fish-ways were already, in his opinion, sufficient in number for the accommodation of the various fish species, and that these inventions had been supplied in many rivers of this country. Having been connected with the work of construction of the dam at Columbia, Pennsylvania, he felt at liberty to state some of the results that have followed from the completion of that work, though, as yet, these results were not fully proven. As stated by the gentleman who last spoke [Mr. Reeder], the ascent to the fish-way is so gradual that a canoe can be poled up it without difficulty, the water not moving in it at a greater rate of speed than eight or nine miles an hour. One of the great troubles is to get the seine-fishermen away from the front of the fish-ways, as they catch a large proportion of all the fish that come through. A number of shad have been caught further up the Susquehanna above the dam, thus showing that the fish had gone through the fish-ways. The speaker then referred to the liberality of the Legislature of Pennsylvania in providing for improvements, such as Columbia Dam, intended to

secure requisite facilities for the introduction of shad, black bass, and other fish. His remarks are given more fully, upon a repetition of them, in the report for the succeeding day.

At two o'clock the meeting took a recess till afternoon.

The presiding officer submitted a number of letters from absent members unable to leave home.

A letter was received from Mr. George E. Ward, on behalf of W. C. Coup, offering the Association the use of rooms at Mr. Coup's new Aquarium at Thirty-fifth street and Broadway, New York city, extending to the Association the free use of a room in the Aquarium building, for the holding of meetings, the establishment of a library, or other purposes desired by this body.

The President remarked that the idea suggested by this offer seemed to him to be a good one, and commended it to the Association. On motion, the thanks of the Association were ordered to be returned to Mr. Coup for his generous offer, and the invitation was accepted.

The presiding officer introduced the subject of the stocking of rivers and other streams with black bass, the adaptation of this fish to still water and the strong currents of rivers, and called upon Mr. Seth Green, as a representative of the Empire State, to respond.

Mr. Seth Green, Superintendent of the New York State Fisheries, in response, spoke of the success which had attended the efforts of the Commissioners of the State of New York in stocking the waters of that State. As an illustration, Mr. Green cited Lake Canandaigua, where, in 1871, the stock of salmon-trout was small, but where, at this time, since re-stocking, it is no unusual thing to make a catch of fifteen or twenty in a day.

Like success has attended the efforts of the Commissioners in other directions. In conclusion, the speaker called the attention of his hearers to the importance, in stocking rivers, of making the number of fish correspond as nearly as possible with the amount of food to be had by them. He had sought to carry out this idea, and commended it as one essential to success in operations in fish culture.

Mr. Frederick Mather remarked that in his opinion the black bass, by reason of its predatory instincts, would prove an injury to the shad when placed in the same stream with that fish.

Mr. H. J. Reeder of Pennsylvania argued that by a proper use of the methods of artificial propagation in shad, no cause for apprehension existed because of the introduction of bass into the same streams with them.

Mr. Seth Green expressed the belief that the black bass would do no damage whatever, and was unwilling to concede that it would prove in any way injurious to the shad.

Mr. M. C. Edmunds gave his opinion that it had been found that small streams were not the proper places for the propagation of black bass.

Mr. Livingston Stone of California (in charge of the fish-propagating interests of the United States on the Pacific slope) called attention to the fact that a car-load of salmon-eggs had recently been sent from that State to Eastern rivers. The number aggregated four million of eggs. The larger portion of these were distributed to the various State Commissioners at Chicago.

The meeting adjourned until the next day, Saturday, at 10 o'clock, A. M.

At 5 o'clock, P. M., the members of the Association, with their invited guests, partook of a dinner of a novel character. The *menu* comprised some sixty-five varieties of fish, served in all styles. The fish had been procured from nearly every country of the globe, including England, France, Norway, Chili, Turkey, Sweden, Cape of Good Hope, Australia, New Zealand, Russia. etc. Among the guests present were the Governor of the State of Pennsylvania, and the Commissioners from England, France, Spain, Portugal, Holland, Russia, Brazil, China, and Japan.

SECOND DAY'S PROCEEDINGS.

CENTENNIAL GROUNDS, PHILADELPHIA,
Saturday, October 7th, 1876.

Hon. R. B. ROOSEVELT presided.

Dr. WARDER of Ohio, being called upon by the Chair, said: Having had the honor to serve as a member of the Fish Commission of Ohio, and knowing something of its operations, I would say that the Commission of that State is a live one, and is following the lead of Pennsylvania in the advancement of fish culture. I hope, sir, that all the other States will emulate the efforts initiated by the States on the eastern slope of the Alleghanies, as no branch of agriculture, in my opinion, promises so much for the food of man as does Pisciculture. In Ohio, the efforts of the State Commission, in the hatching-houses, has been attended with very considerable success. The hatching of the eggs of various species in the waters of the State is going on. The recent introduction of salmon from the Pacific coast has been attended with remarkable success, and the experiments that have been made with salt-water salmon in the fresh waters of the State have been most pronounced in their results. It has been

shown that that fish, which only seeks the salt water at certain periods, may be propagated with success in fresh waters. Whether the results of years of training in fresh water will produce the salmon that come to us direct from the sea is a question which remains yet to be tested. Among the objects prominently held in view in the State from which I come, one of the first has been the reproduction of the whitefish, and the adoption of such means as will have a tendency to prevent its destruction by the fishermen in Lake Erie. This is the great fish of Lake Erie. The first of the species ever taken in the waters of the State was caught with a hook near Sandusky. In making these statements I speak, of course, upon the best information that could be obtained. The efforts that have been made to acquire reliable information were largely made among the fishermen, but this class could only answer as to a part of the matters concerning which information was desired. These men, who are interested in the business only so far as the profits of their catches are concerned, can be depended upon for certain facts, but, when applied to, were utterly ignorant of other equally essential and more important facts. It has been left to scientific men to develop the peculiar circumstances under which the eggs of the whitefish can be treated most successfully for a beneficial result. It has been found that the fish spawn late in the Fall, near the shore; and the trouble has been to protect them from destruction by the lines and nets of the fishermen. They are in danger of being cut off through carelessness, and artificial means have been resorted to and put in operation for the protection of the fish and its young. The speaker added that visitors to the lakes sometimes noticed a difference in the flavor of the whitefish, and the explanation of this was that in the summer months the fish are not in the

condition that is acquired by them when they approach the shore later in the season.

The presiding officer, upon the conclusion of the remarks of Dr. WARDER, invited further discussion upon topics incident to fish culture, and suggested, as one appropriate subject, the peculiarities of black bass, particularly as to its alleged predatory instincts.

Mr. FREDERICK MATHER objected to black bass, as he believed that they were disposed to prey upon other fish.

Dr. WARDER of Ohio noticed the disappearance of the maskinonge and pike in Lake Erie. At points where at one time there were caught pike weighing from fifty to seventy-five pounds, there are now but few left, and those few are quite small.

Dr. JAMES W. MILNER of Washington, D. C., remarked:

In reference to the pike family, *Esocidæ*, the common names of the various species are habitually confused. The pike of the great lakes and West, are often called pickerel. In Lake Erie, the wall-eyed pike, *Lucioperca Americana*, pickerel; while they were far removed, in their zoological relations, from the true pickerel, *Esox reticulatus*, found only on the eastern side of the Alleghanies. The lake-pike is of the same genus, but are an entirely and well-marked seperate species. The muskellunge is also separate from either of these. Other species are known. These three are to be distingushed as follows: the pickerel, *Esox reticulatus*, is distinguished by having scales over the entire cheek and operculum, and being marked on the body by reticulated, brown lines like the meshes of a net. The lake-pike, *Esox estor* or *E. lucius*, has the cheek covered with scales, but the lower portion of the operculum and the sub-operculum is naked; the

coloring pattern is a series of oval, white or chocolate spots on a greenish ground. The muskellunge, *Esox nobilior*, has the lower portion of cheek and operculum and the sub-operculum naked, and has oval, black spots on a dusky, greenish ground. These characters are strongly marked, and a slight examination suffices to determine the species.

Mr. MATHER then gave some interesting remarks on the grayling. He regarded the grayling as certainly being much easier to propagate than the trout, but he did not think it as good a food-fish. He held that when it came to a question of the table, no fresh-water fish was equal, as an edible, to fish of the salt-water varieties. The grayling is a gamey, handsome fish, and makes his home in the same kind of streams in which the trout is to be found. It affords much sport to the angler, and in certain portions of the trout-fishing country is one of the delights of trout-fishing, giving him the same delightful surroundings that have made that sport so popular. He could not tell what was the lowest temperature at which the grayling would thrive, but it lived and did well in his ponds at Honeyone Falls, and also at Caledonia, N. Y. Those which he brought from Michigan three years ago were within two weeks of their spawning-time when brought from there, but they had never spawned yet. The only eggs which he had procured and hatched had been taken from the fish in their native waters. He will hatch them in the New York Aquariam during the coming winter or next spring.

Col. JAMES WORRALL of Pennsylvania, a member of the Fish Commission of that State, made a further statement of the results of his observations and practical experience upon these improvements in fish-ways, particularly as to the one at Columbia, Penn. The salmon family, he stated, had for years gone

up to their accustomed haunts over the dams and through the ways, but the shad are still afraid of the fish-ways, and timid about ascending them. The shad is an exceedingly timid fish. It has been said of it that it is afraid of its own shadow, and possibly it may have derived its name from that fact. However, in the course of time, as they become accustomed to the fish-ways, they may lose their timidity in that respect.

They had built a fish-way here in Pennsylvania at Columbia. It is 105 by 60 feet. It has been built with an inclination that does not cause the water to run faster than at a rate of eight miles an hour. A fish that cannot go up through a current running at that rate must indeed be a poor, miserable creature. Large numbers of shad have passed up through that fish-way, but still it has not been as successful as we anticipated it would be. How to better it is now the question. He was satisfied that if the shad wanted to go through they could do so without the least difficulty, and that very considerable numbers did go through is shown by the quantity of shad that have been caught further up the Susquehanna. He was in hope that the progeny of the eight or ten thousand shad that have gone up the stream heretofore will come back in succeeding years, and thus, after a while, the difficulty be overcome. The run this year, however, was the poorest known for fifty years. The shad which were hatched in 1873 are due next year, and he hoped that they and the California salmon will come back together. Should eight or ten thousand go through this year without difficulty, these will spawn in the river above, and the supposition is that after going down to the sea, the spawn will return, and at the usual season each year the number will be increased. If the scaring of the fish could be prevented all would be well. As it is, the number of shad caught above the fish-ways of our rivers exceed any number in other States. The State was willing to give us

money when we asked for it, but we do not wish to ask for it until we can show more tangible results for our past labor than we have yet been able to show. The Legislature had acted generously in the appropriation of money, and the people of the State had manifested a very deep interest in the work of the Fish Commissioners. The Commissioners had been going along quietly, being mainly occupied in depositing fish received from the State of New York and other places. He had been informed that the salmon-trout received from the New York Commissioners, some two and one-half years ago, are doing remarkably well in the streams of Chester county, these streams passing through volcanic rock, and being of that pure water, and of that temperature in which trout best thrive. This being a lake-fish, the fact is the more gratifying. We cannot yet, however, say definitely whether we have been successful with them or not. In England and Scotland some of the streams contain salmon-trout, a fine fish sought after as a game-fish, and growing to from four to six pounds. They live in the same streams with the true salmon, and I do not see why they should not here. Whether it is or is not the salmon-trout of our lakes he cannot say. All the other fish distributed in Pennsylvania appear to be doing well. Of the California salmon the Commissioners cannot yet speak definitely. A few strangers to the fishermen, being probably the laggards that did not go down to the sea, have been caught this year. This fish is expected to return next year, and if the expectation is realized, all the outlay of Pennsylvania will be a hundred-fold compensated for, as no grander achievement could be gained than the permanent introduction of California salmon into the streams of Pennsylvania. With this end in view it is only necessary to place the fish in the Delaware and Susquehanna Rivers, the two main

rivers east of the Alleghanies; because if they should increase they would soon extend to all the tributaries of these streams.

The speaker, to illustrate his meaning in this particular, proceeded to explain the peculiar and tortuous conformation of the water-shed of Pennsylvania. There would be no difficulty, by this means, in supplying the streams east of the Alleghanies. Black bass had been placed in the Delaware and Susquehanna Rivers some seven years ago by private individuals, and the result has been that both of those great streams are now supplied by that magnificent fish, a thing worth ten times all the money spent by the State of Pennsylvania on fish culture.

The presiding officer here invited a continuance of the discussion.

Mr. Seth Green remarked that he could explain the cause of the disappearance of the shad, this being because the waters were over-fished. He thought there should be a close time for shad, at least forty-eight hours in a week. He said that one reason why the shad do not ascend the fish-ways in great numbers, is that they are generally netted at the foot of the dams, or in close proximity thereto, and this frightens away those that are not caught. He thought that the fish-way invented by Mr. Brewer of Muncy, Penn., was the best one now in use. It had been tried in New York, and had worked with great success. It was built to face the dam, and not on the side, as most others are constructed. Ways built like this the fish will find, but those on the side they will seldom find.

Mr. Weber expressed the belief that, as a general thing, the fish would not use a straight fish-way, but that a semicircular fish-way, such as the one adopted by the Massachusetts Fish Commission, would prove of the greatest practical utility.

Mr. Frederick Mather said that last year he made some experiments with fish-ways in Virginia, and found that those which ran under the dam did not work well. He had made a way to go below the dam, and found that so many fish crowded into it as to choke it up. His conclusion was that the fish-way should be so constructed as to run from the dam up-stream, instead of running from the dam down-stream. The best and most economical way to test fish-ways is in the hatching-houses, where their effects can be closely watched.

The presiding officer remarked that as Virginia had just been mentioned, he would call upon a representative of that State present, Dr. Robertson.

Dr. Robertson of Virginia said that in his State California salmon had been extensively introduced, and were doing well. It was proposed to raise there this winter a great many trout, as that fish was best adapted to the swift mountain-streams of the State. The trout-fishing in the Adirondacks is very famous, and deservedly so, but it does not excel that of Virginia. We have had a great deal to do with black bass, and we like them very much, and hope that in a few years the bass-fishing in the James will equal that of the Potomac.

The following gentlemen were made members of the Association :

Dr. C. A. Kingsbury, 1119 Walnut street, Philadelphia, Penn.
Dr. H. C. Yarrow, U. S. A., Washington, D. C.
Greene Smith, Peterboro, N. Y.
Charles Hutchinson, Utica, N. Y.

The Association then adjourned.

Sixth Annual Meeting.

The American Fish Culturists' Association held their Sixth Annual Meeting at the New York Aquarium on Wednesday, February 14, 1877.

Introductory Address by R. B. Roosevelt, Esq., President.

In calling the meeting of fish culturists to order, I will give a succinct resume of the operations of the Commissioners of the State of New York, from their appointment, which occurred in 1868, to the present time, a period of nearly nine years, or, more properly speaking, of eight years, as the first year was devoted to an examination of the condition of the public fisheries throughout the State, and not to active operations on any important scale.

Shad.—The artificial propagation of shad was recommended in the first report submitted, and in the following year, 1869, operations were commenced, and 15,000,000 shad were hatched. This work has been vigorously prosecuted ever since, and, including last year's operations, a total number of 49,880,000 young shad have been placed in our waters.

Salmon-Trout.—The first experiment of the New York Commissioners with salmon-trout was attempted in 1870, under the most dangerous circumstances, Mr. Monroe Green, who was taking the eggs, nearly losing his life in behalf of the experi-

ment. It was successful, however, and the undertaking thus inaugurated has been annually continued, and a total number of 5,947,000 fry and 456 boxes of salmon-trout eggs have been distributed.

Whitefish.—The artificial culture of whitefish was commenced in the fall of 1868, and the eggs were hatched out in February, 1869. From these, as also from a farther instalment received from Detroit, in 1870, the Commissioners were enabled to make distributions to numerous applicants, and several shipments to England. To the present speaking, 1,758,000 fry and 26 boxes of whitefish eggs have been delivered.

Salmon.—Salmon culture was first attempted in 1871, when 4,000 impregnated salmon *ova* were obtained from Canada, in exchange for 2,000 salmon-trout fry and 2,000 young whitefish. The work, although at various times repeated, has met with no very encouraging demand from the public for a supply of the young, the total number distributed amounting to about 210,000.

California Salmon.—This fish was first introduced into the waters of our State in 1872–'73, as being better adapted to them than the true salmon. During that and the following year a total of 636,000 have been distributed. Of these many young have been seen in the fresh waters, but it is not known that any have visited the sea and returned.

Blue-backed Trout.—Five thousand of the eggs of this fish were purchased from Maine in 1874, and in 1875, 4,000 more were received; but in consequence of the bad condition of the eggs when received, and the small number which were hatched, the Commissioners hardly consider the attempt at their acclimatization deserving of consideration.

Eels.—Some little attention has been devoted to this class of

fish, but more to its protection than progagation. In 1874, 36,000 of them were placed in Buffalo Creek, above Niagara Falls, to see what would be the result of introducing them in Lake Erie.

Sturgeon.—Experiments with this fish, made about four years ago, but unsuccessfully, were repeated in 1875 with great success, about 100,000 young fish being turned into the Hudson.

Brook-Trout.—An establishment for the hatching of brook-trout was purchased in 1875, and operations immediately commenced; 1,229,000 of the young fry have been distributed, and 24 boxes. Importations of California brook-trout have also been received. Of the first instalment in 1875 of 1,800, 260 hatched out, many of the eggs having been spoiled during transit.

Bass, Pike, and Perch.—The artificial propagation of these fish was first attempted in 1874. Since then there have been distributed 6,726 black bass, 2,532 Oswego bass, 17,764 rock bass, 1,592 pike, 1,336 perch.

Of the 647 lakes in the State, a majority have been stocked to a greater or less degree, and in many most gratifying results have been obtained. Trout are now being put in many of the streams, so that in a few years there is reason to believe that the fisheries of the State of New York will be fairly productive, and vastly more so than they have been of late years.

PROTECTIVE LEGISLATION.

Dr. J. W. Milner, of the Smithsonian Institute of Washington City, read a paper on the legislation in regard to fisheries.

ON THE FISHERIES OF HOLLAND.

C. J. BOTTEMAN, Superintendent of Fisheries in Holland, said:

I am sorry that Mr. Milner, in his explanation of protective legislation with regard to fisheries, did not speak of Holland, the great land of fishing, where there have been of late great changes in the laws. There has been great trouble from having no enforcement of the laws; but since 1869 this state of things has greatly altered, so much so, that the rivers that in 1860 gave only about 37,000. were increased simply by legislation, and at the same time trying artificial culture, from 37,000 to 150,000 in 1872. That proves what legislation can do. They have lately begun in Holland to establish the business of fish culturists, men who have nothing to do except with fisheries, and that is just what we need here, and what we need not only for one State, but for the whole country.

Mr. WILLIAM M. TILESTON said:

The trouble, so far as our own State is concerned, is, I think, that we have too much legislation. You may be aware that in the game-laws of our State there is an unfortunate clause which has been the cause of a great deal of trouble—one that permits the supervisors of counties to make their own laws and regulations with regard to fish and game, provided they do not conflict with the general laws. But this point has been overlooked, and the supervisors of many counties have passed ordinances in conflict with State laws, and the result is that both are nullified, and that nothing can be done. With regard to Owasco Lake, Cayuga county has had more legislation than any county in the State, and yet there is more spearing of fish out of season

there than anywhere else, from the very fact that there is so much legislation and the laws conflict, and nothing is done whatever.

Mr. Tileston gave an invitation, on behalf of Messrs. Coup and Reiche, to members of the Association to visit the Aquarium at half-past three, and see a species of fish not described in the catalogues; and proposed the name of Mr. William C. Coup as an honorary member of the Association.

The motion was seconded, and Mr. Coup was accordingly admitted as an honorary member. The Association then took a recess of ten minutes for the purpose of visiting the Aquarium.

The President announced as the Committee on the Nomination of Officers for the ensuing year, Mr. Green of Rochester, N. Y., Mr. Tileston, and Mr. Evarts.

CANADIAN FISH CULTURE.

The President: I would ask Mr. Wilmot to address the Association. He has been kind enough to bring a specimen of salmon that was hatched in the waters in which he has been so successful in cultivating salmon, and which had gone down to the lake-water and returned without ever having gone to the sea, having marks upon it to identify it, which he will explain.

Mr. Samuel Wilmot, of the Fish Commission in Canada, said:

It affords me much pleasure to be present on this occasion, I assure you. It was quite unexpected to me to be here, for it was the intention of the Government of the country which I represent to send a Commissioner, whom circumstances prevented from coming; for the Parliament of Canada being in session, he has been obliged to be there to give such aid as he

could with regard to the interests of fish culture in Canada. I received a telegram from him on Saturday evening last, to the effect that he would be pleased if I could spare the time to attend this meeting. It has given me much pleasure to be able to be here, particularly at the place where your meeting is held, for there is a vast amount of information to be obtained in the Aquarium down stairs; and it is also a great source of pleasure to become acquainted with so many intelligent persons connected with this Association.

I was very much pleased with the address of Prof. Milner. I am pleased to find that both himself and Prof. Baird have changed their views with regard to the protection of fisheries by legislation. It has been a hobby of mine that legislation is as important as the breeding of the fish, and perhaps more so, because I think that if proper legislation had been carried out from the first settlement of the country up to the present time, the art of breeding fish by artificial means would not have required at this time the protection of law, for our waters would have been teeming with fish. I have always held that there is necessity for strict legislation with regard to the preservation of fish at its breeding season, and we only ask a very short time to protect them. Fishes mostly deposit their ova within a short period of time, varying from ten to fifteen days, I should say; and if the Government of the country would set aside those few days, so as to give them time to deposit the eggs, the probability is that a large proportion of them would become living fish. But from the first settlement of the country, when the fish came within our reach, most needing protection, we have gone to destroying and killing them while they are laying their eggs—as unnatural as it is unwise. It is the first duty of the Legislature, with regard to this subject, to say that we have been doing wrong for a long time, but we will remedy the matter as soon

as we can, and we will pass judicious laws to aid the produce of the fish as much as we can, and to assist those engaged in the artificial method as well, because it is now necessary to supplement the natural mode, which has been so seriously interfered with that they cannot produce as numerously as they ought to supply the immense increase of population in this country. We have to resort to artifice to prevent their being reduced in numbers.

Let me say here that the remarks which fell from my esteemed friend, Prof. Milner, I cannot fully indorse. He says that the Dominion of Canada is better able to protect its fisheries than the United States. If I recollect rightly, Canada has a population of three or four millions, and the State of New York alone has a population even greater than that, and the population of the whole United States put together is not far from fifty millions. You will see that if the Dominion of Canada, covering as much territory as the United States, extending from the Pacific Ocean to the Atlantic, can, with its small means, have judicious laws and officers, and pay them for the preservation of their fish, the United States, with its immense population and wealth, surely can follow in the same footsteps, and endeavor to preserve their fish in the same manner as we do. And if they do, it will render us aid, because many of our rivers and lakes are international boundaries, and the consequence would be that our laws could be more properly carried out than at present. We find now that the people living on the American side of the rivers and lakes, having no laws, it makes our men disobey the laws that we pass, for they come to us and say, "You are passing laws on the Canada side, when there is no law on the American side, and why should we be trammeled by a law that they are not?" Take the Detroit River, for instance, Lake Ontario, the whole chain of

lakes dividing Canada from the United States, and it is with great difficulty that in those waters we can protect our fish. The Americans having no laws, they do not see why we should have laws in Canada. I think, therefore, that, so far as Prof. Milner's ideas on this point are concerned, they must fall to the ground when he states that Canada is better able to protect its fisheries than the United States.

With regard to the success that has attended the fish culture in Canada, I will make a few remarks. In 1865 I commenced, as an amateur, in my own dwelling-house, in rearing a few fish. In 1866–'67 the Government of the country heard of what I was doing in a private way. I sought, if possible, at that time to make it a private undertaking, and endeavored to obtain a certain portion of the lake in front of where I lived, and asked that it should be given to myself, in order that if I produced fish there that did not then exist, I should have the benefit of it afterwards. The Government thought that that would be creating a monopoly, and that if there was anything to be made out of fish culture they had better take hold of it themselves, and they did so. So that from that small beginning of mine, in 1865, we have extended over the Dominion of Canada these large fish-breeding establishments, in which there are at present about six millions of salmon almost ready to hatch out, and nine millions of whitefish also just ready to hatch out. In these few years the strides of Canada in the direction of fish culture have been very great. Originating from the planting of a few eggs in the parlor of my own dwelling-house, it has extended through all the Provinces except those on the Pacific coast.

The buildings that we are now putting up are of a very permanent nature. The Government has taken the view that what is worth doing at all is worth doing well, and that the buildings should be made in as satisfactory a manner as

possible, and they are capable of rearing in each of them from two to ten millions of eggs, depending upon the description of the eggs, and I am able to state that their present position is most favorable.

The question may be asked, "What success has attended the efforts of Canada in the propagation of fish in this artificial way?" The specimen of fish hanging on the wall, to which the President has referred, is, in my estimation, a proof of the value of the artificial culture of fish in which I have been engaged. The stream in which I have been operating, which has been almost exclusively under my own cognizance, in 1865 or 1866 was almost perfectly depleted of fish. No salmon, comparatively, entered it at all. But from what we have done there last autumn, these fishes were in thousands in that small stream, ranging from five to twenty pounds' weight, coming back to a stream so small that in many instances we have had to take rakes and hoes and spades to make channels in the bed of the stream for the fish to come up. The stream is so small that you can leap over it in any portion of it except after heavy rains. It was larger many years ago, but from the face of the country having been cleared off, the consequence has been that the springs and smaller rivulets that fed it have dried up, and the stream has been consequently very much diminished in size; so much so, that when we find large salmon unable to get up and surmount the rapids, my men turn out with their rakes and hoes to enlarge the channel through which the fish pass and go into the building which has been erected for them, where we gather the eggs. You see what can be done in a few years with regard to reproducing, in a small stream like this, that magnificent fish. I brought this specimen in order that the gentlemen of this Association might see it. It was caught in July last, immediately at the outlet of this small stream in Lake Ontario. There was an effort made by our

Government last year to determine what had been the result of artificial propagation of salmon in this identical stream, and they gave a license to a few individuals to put out a trap-net in order to ascertain the result, and in the course of the fortnight there were some three hundred of these salmon taken within half a mile of the outlet of this stream. This is one of them. That fish, when taken from the water, was seventeen pounds in weight, and I kept it as a *rara avis*, because I found it had two marks upon it which I had put upon it in previous years. For some time I pursued the custom of marking the grilse, or small fish, when they came into our enclosure, after taking the milt from them ; then we would take a punch and perforate the large adipose fin the first year, and the second year we would put a a similar hole in the tail-fin. You will see there both of these holes, so that that fish must have passed through my hands, or those of my assistants, for two years in succession, and this would have been the third year. I claim, then, that that is a fish produced in that very building where I am now rearing fish, and it would have come back again this time if it had not been caught in the net, making three years that that fish would have migrated back to the stream in which it was bred. I brought it here not only to show the result of the few years in which we have been engaged in producing fish, but particularly to show that the fish return to the spot where they are bred.

It was my intention to make Prof. Baird a present of the fish as a sort of record of the fish culture. I also brought it for the purpose of comparing the modes of preserving specimens of fish, expecting to find here similar specimens of fish stuffed or preserved, and also plaster casts of fishes, which are said by professional persons to be better adapted for showing the description of fish than the stuffed fish itself. On that point I take issue with them, and say that if properly stuffed they will

show their natural colors infinitely better than any plaster cast can be made to show them, and they will cost much less than it would cost for an artist to imitate the natural colors. A fish stuffed like this specimen can be produced in an hour and a half or two hours by any ordinary skilled person, but I have not been able to make a comparison with plaster casts, because I find none here.

I will return to the subject of the protection of fish. Sometimes it will be difficult to legislate thoroughly for their protection. The whitefish is an example of that kind. On the Detroit River the whitefish come in vast numbers only in October and November, when they lay their eggs. The trade has been immense for a series of years, but it has fallen off wonderfully of late. I am of the opinion that if proper laws are not instituted by the United States, in connection with ourselves, the immense fisheries on the Detroit River will soon be practically annihilated. In order to recuperate and recover what we have lost as much as we can, the Canadian Government have erected a large whitefish breeding-establishment there, and I am pleased to state that the Americans also have erected one in the city of Detroit. So that the action of the Canadian Government there has had the effect of inducing the people of Michigan to do a similar thing. I understand that in Iowa, and in other States in the West, they are also doing the same. I think that whitefish might be permitted to be killed during this season, because, if a law was passed that they should not be killed when they come there, it would prevent the fishery altogether. It would be better, perhaps, that only a few days should be given to their preservation, because, when the whitefish are taken from the nets and brought on shore, and are manipulated by skilled hands, the eggs can be taken from them, which is a clear gain. The fish can be brought on shore

and sent to the market, and the eggs, which would otherwise be disposed of as offal, would be taken care of in the breeding-houses, making a clear saving of those eggs, which would otherwise be totally lost. I think, therefore, that it would hardly be proper to pass a law that the fish should not be caught during the spawning season, because, if you do, it would annihilate the fishing altogether.

One great benefit has accrued as the result of this Association, and the United States Government, having taken up the question of the fisheries, which is the great interest Prof. Baird has taken in bringing from the Pacific coast the California salmon, and planting it in the waters of the Atlantic. That is a subject of the highest possible importance, not only to gentlemen connected with this Association, but to the country at large. It was an effort in the right direction, and I think it will produce a beneficial effect. I have had the pleasure of getting some of those eggs for the last three years from Prof. Baird, which I have planted in this stream, passing where my establishment is, and last autumn fish of considerable size came back in the stream along with these other salmon, which turned out to be California salmon, weighing about three pounds. Whether any record exists in any city in the Union of California salmon of that size having been seen, and having come back by their own natural migration to the place of their breeding, I do not know. If there is, I would like to hear of it. Here is the result, that the California salmon has become acclimated there, and has come back fish weighing three pounds in the course of three years, for those fish must have been the first eggs I received from Prof. Baird; and if you can in three years, in Lake Ontario, where there is no salt water at all, rear fish capable of rearing there yet—for this was sufficiently advanced to reproduce—this may be regarded as an indication of what

may be done hereafter with the fish Prof. Baird has brought from the Pacific coast.

Mr. Green drew my attention a few moments ago to the display of fish in your Aquarium. There are a number of speckled-trout, specimens of salmon brought from Lake Ontario, and specimens of California salmon, there. Mr. Green tells me that the fish in the tank below are the fish he obtained from me; the eggs he received from me some four years ago, and they have grown to a handsome size. Your Government may lend a helping hand and benefit the people at large; but it is absurd for an individual to take up the enterprise of fish culture with the idea of making money independent of governmental protection. As to speckled-trout, of course a man may have his preserves, where he may have a few fish; but when you come to the question of raising fish for the consumption of the millions, then it becomes a work for the Government, because the fish, and especially the salmon, migrates to the lake or the ocean, and whatever is done must be done *pro bono publico*. The individual cannot reap the reward of his labors which he is entitled to. I therefore believe it is the duty of every State government in this immense country to foster and carry on the work of fish culture as much as they possibly can. No individual can afford to spend a large sum of money in rearing fish, and then turn them out, when they will be killed or destroyed immediately afterwards. If it is necessary to propagate them at all, it is necessary to preserve them and to protect them.

The culture of fish is one which has been a labor of love with me. I have been engaged in it many years, and the more I see of it the more I like it, and the more I desire to do. It is a subject which should engage the attention, not only of Canada and the United States, but the world; and I am pleased to find that in nearly every civilized nation the Government is engaged

in the artificial production of fish, showing clearly and plainly that they regard it as a work of importance, to be carried out as successfully as possible.

The President: There is a subject to which I wish to call your attention: the question between the Canada-trout and the sea-trout. I see that some put them down as *salmo Canadensis*, and others as *salmo fontinalis*. The question comes up, whether they are sea-trout. There are three specimens sent here, and I should like to ask your opinion whether these are the *salmo fontinalis*, or a new specimen.

Mr. Wilmot: I shall give my opinion very broadly, because I am satisfied that what I state will be objected to. I am of the opinion that the sea-trout, or the *salmo fontinalis*, is one and the same fish; that you may make the sea-trout the *salmo fontinalis*, or the *salmo fontinalis* the sea-trout, at your pleasure. Take the eggs of the sea-trout and put them in the waters of our inland stream, and you will have a speckled-trout. Take the ova of the speckled-trout and hatch them out and let them go down to the sea, and you will have the sea-trout. I have taken a great deal of trouble in the last four or five years in the establishments over which I have some control, to look closely into the matter, and I am convinced that they are identical and the same fish—that you make one or the other at your pleasure. I presume that some of the scientific gentlemen may go further than I do, and say there are a few more spinous rays in the tails or fins, or something of that sort; but I am speaking of it practically. I do not, for a moment, wish to suggest any unbelief in the science in which these gentlemen are engaged, but I think that although one may have more spinous rays than the other, or more teeth, or a different color, they are the same practically.

Mr. SETH GREEN: Do you not find the same fish in fresh water?

Mr. WILMOT: We do. We find at the foot of some insurmountable falls, up in the stream above, this little fish, the *salmo fontinalis.*

Mr. GREEN: Is not that the fish you take when you take the salmon on the fly? Do you not catch both in the same pools?

Mr. WILMOT: Yes, sir; you catch the salmon and the speckled-trout in the same pools. In the little streams, above the large falls, you will find large numbers of the speckled-trout, and also larger ones called the sea-trout, because they have been down to the sea; but they are silvery in their appearance, while the little ones are black-looking; but those little ones will get plenty of food and return to the same spot as sea-trout, because we catch them all together.

Dr. MILNER: The question of these trout is one on which there is a great confusion so far as the ideas of naturalists are concerned. The *salmo Canadensis* is described as having red spots. Another species was described without red spots. I know that on the coast of Long Island the *salmo fontinalis* runs down into the salt water, and is taken out of the salt water. Whether the *salmo Canadensis* and the *salmo fontinalis* are to be considered as different species or not, I do not know, but there is a sea-trout which is not a *salmo fontinalis.* Dr. Hudson informs me that Mr. Bracket, the painter of salmon and other fishes, in painting sea-trout from the waters of New Brunswick, found they were without red spots, and two specimens were sent to us to the Smithsonian Institute, from Dartmouth River, which were without the red spots, and were decidedly the *salmo fontinalis.* Whether *salmo Canadensis* and the *salmo fontinalis* may be proved to be identical or not, I am

unable to say. That is a question that cannot be hastily decided We should have a great many specimens of each form, and make a critical and close study before any decision is made.

The President: One word on the subject of the red spots. It is a very curious fact that people do not always see what is before them. We had an instance of that on the subject of the Oquassac trout, that came around here some time since. The question was brought up whether the Oquassac trout was a *salmo fontinalis* out of season; and I think every one who examined them was ready to go into court and swear they had red spots—carmine specks as I distinguished them—a speck being very small and a spot larger; yet everybody knows that the Oquassac trout has no red spots at all; and when the parties who had so described the fish looked at them, they could not believe that the spots were not there, which they thought they had all seen. So with regard to these sea-trout, sometimes called salmon-trout. I have taken those, and when I first glanced at them I thought that there were no specks on them at all. Look at those specimens, and you will see that there are no carmine specks on them at all, they being exceedingly silvery; but on close examination I found in every instance carmine specks there, brilliant and bright, but overshadowed by the brilliancy of the white color; so that I think on that subject the gentlemen who reported that there were no spots, simply examined the fish generally, and did not notice the spots on the specimen at which they were looking.

Mr. E. G. Blackford of New York: I would like to say with regard to trout caught in salt water that it is identical with those caught in fresh water. I have received handsome trout caught down in our harbor, weighing three-quarters of a pound, Long Island trout, with all the markings identical, and had

I not known the man who caught them, I should have thought he had taken them out of some stream.

I feel that I ought to say something about brook-trout and the laws regulating their sale. I am in favor of the most stringent laws preventing the sale of brook-trout out of season, but I do not think you ought to frame those laws so as to embrace innocent persons. I went, with two other gentlemen, to Albany in the early part of last year, when the Legislature was in session, and when the Game Club were endeavoring to make the law more stringent, in order to have the law so framed that a person proving that he had no guilty intent in having in his possession brook-trout out of season, should not be punished with a fine. My reason for taking such an active course in this matter was this: our President will probably recollect the circumstance, for I addressed him a communication at the time. A party in Newcastle sent to me, on the first day of March last, some boxes of brook-trout, genuine *salmo fontinalis*, he laboring under the impression that our laws enabled the sale of brook-trout after the first of March. The first notice I had of the trout was that some boxes were landed at my stalls in the market, looking like boxes of smelts; I took a hammer and knocked off the cover, and found there brook-trout enough to amount to a fine of about $75,000. I was bothered to know what I should do. Had there been one of the informers of the Game Society there, who keep us poor fishermen under such constant supervision, and had he seen those trout, I would, under the law, have been found guilty of having trout in my possession out of season, and I should have been liable to a fine for each and every fish. I erased my name from the boxes immediately and set them out on the sidewalk, and when asked about them, I did not know to whom they belonged. Then I employed an expressman to take them back to the steamboat

dock where they were brought from, and to leave them there for further orders. Then I wrote a letter to Mr. Royal Phelps, President Society for Preservation of Game, and Mr. Roosevelt, and others, and asked them what course I should pursue. They all told me what would be the consequence if they caught me with the trout, but they did not tell me what to do with them. The next day, by mail, I received the invoice of the trout. Now, although there was no intent to evade the law of selling trout out of season, I became liable to a very heavy fine. The Game Club have an idea, I think, that every man engaged in the fish business is a suspicious character, and they will not believe but that I will sell brook-trout at all seasons. Talking with several of the members, they seem to think I have been too smart for them, and that was the reason they have not caught me in it, but they will catch me some time or other. They sent an officer one time with a search-warrant to search my stores, and they exposed my fish and put me to a good deal of damage, because somebody had given information that I had stored on my premises a box of Long Island brook-trout. It is a benefit in my business as a trout-merchant to have a close law; for after the 15th of March I can sell more trout in thirty days than I could if you had the sale open the year through. Now with regard to these fish and the final disposition we made of them: I shipped them to Boston, and they remained there until the 15th of March, and then they shipped them to me again, and I sold them legally and lawfully, and, so far as I could discover, they were about of the same quality as those which we received from Quebec and Montreal in March and April.

Mr. Wilmot: Were they received from New Castle, Ontario, or from Newcastle in New Brunswick?

Mr. Blackford: Newcastle in New Brunswick.

Mr. Wilmot: That alters the case, for the present season for

catching trout in Ontario is extended to the 1st of April. It was formerly the 1st of January, but regulations were passed that salmon-trout should not be taken in the Province of Ontario until the 1st of April, and in the lower Provinces I think it is January still.

Mr. GREEN: Some twenty-five years ago a vessel started from our place and went down on purpose to catch these fish. They went around to the mouths of all these salmon-streams and caught quite a cargo of them. They not only caught them in the salt water, but in the St. Lawrence outside of the streams. They had the best fishing where the streams came in, and they went up the streams as far as they could go with their boats, and caught the same fish; and in my opinion they were the brook-trout.

Prof. SPENCER F. BAIRD: In response to a question of Mr. Wilmot with regard to the agency of a United States Commissioner—myself—in regard to the introduction of salmon, I must honestly disclaim the credit of that enterprise, and give it to this very Association. You may remember my having been in Congress at the time the United States Commissioner was authorized, and that the original object was to prosecute an inquiry as to the decrease of the fisheries, which had nothing to do with the propagation or multiplication of fish; and for myself the working of the Commission was confined to endeavoring to ascertain whether the fish on the coast of the United States had decreased, and if they had, what was the cause; and if the cause could be found, what was the remedy. During that same year, 1871, the Fish Culturists' Association had its first or second meeting, and resolutions were presented appointing a committee to proceed to Washington during the coming session, and to memorialize Congress on the subject of natural action in the propagation and distribution of fish. That committee discharged

its purpose, and an appropriation was made for the propagation and placed under my charge as Commissioner to disburse.

Feeling my ignorance of the theory and practice of fish culture, knowing a little about fishes themselves as to their zoological characteristics, but nothing about the mode of multiplying them, I considered it my duty and pleasure to counsel with the Fish Culturists' Association and the Commissioners of the States present; and I spoke to them and asked them what I should better do, in what way the best measures could be taken to increase the fish supply of the country. Two propositions were made: one that a certain portion of the appropriation should be expended in assisting the enterprise of obtaining the eggs of salmon from Maine, and the other that we should send some one out to California for the purpose of obtaining eggs from their fish, as it was known that eggs could be had there more readily and in larger numbers than in the East. Both of those suggestions were adopted. Mr. Atkins, then at work on the Penobscot River, was requested to enlarge his fisheries to enable us to cover the ground we desired, which was to be done out of the funds at my disposal; and Mr. Stone, now present with us, went out to California to organize the California salmon enterprise; and beginning on a small scale at first, with 2,000 eggs, the capacity of the establishment has increased in consequence of his admirable management of it, until now it is capable of furnishing at least 15,000,000 eggs every year, which more than equals in the aggregate that of all the European salmon-producing establishments together.

I presume it will be agreeable to the meeting to hear something of the general operations of the United States Commission with regard to its measures for fish propagation, and I will proceed to sketch briefly what they are, and will then refer you to Mr. Milner, who has the shad department more especially

under his control, and to Mr. Stone to tell you about the operations in California. I will state that the United States Commission have always endeavored to carry out the principle of doing nothing on its part that the States should be or are willing to do; and while it takes charge of the rivers and large bodies of water that belongs to the several States, it leaves to the States themselves the care of fostering the fishers' interests in the rivers which belong exclusively within their jurisdiction. Therefore, with regard to such fish as the California salmon, it was considered best to confine the operations of the United States Commission almost entirely to the gathering of the eggs, and to distributing those eggs to the said Commissioners in such quantities as should be called for, they being charged for the payment of packing and expressage merely on what they took. During these years the operations with regard to the California salmon have therefore been constituted on about the same scale as at present, the appropriation being about equal to the demand, and sufficient to pay for the distribution to such States as had no Commissioners. A certain number of eggs were brought to the East, and part to the establishment at Northfield, at Michigan, and a part to the Central Park, from which they were distributed to a very large number of rivers. There are comparatively few principal streams which we have left unsupplied with these fish.

The operations with regard to shad for the last year were much more limited than before, as the appropriation available for the purpose was not passed until early in May, when it was too late for the southern rivers, as in previous years the eggs were furnished to the Commissioners of the States, or shipped to other parts. Nothing was done this year with regard to the Bucksport salmon. It was considered undesirable to breed land-locked salmon. We have rather preferred to wait and see the result of the operations with regard to the land-locked salmon.

The operations with regard to the land-locked salmon were carried on on a larger scale than before, but owing to some peculiar condition of the water or the temperature, a much smaller number was obtained. I think about 400,000 eggs were all that were obtained by the parties jointly interested—the United States Commissioner, the Commission of Massachusetts, and one of Connecticut—a division having been made of the eggs between these three parties.

Another enterprise, which promises well for the future of the fish culture of the country, from a supply of food fishes, is that with regard to the carp. The carp is a fish not very well known to this country, but occupies a prominent place in Europe as a stock-fish. It can be cultivated in any barn-yard tank. It can be cultivated in tubs. They can do as the Chinese do, raise them in large tubs, feeding them with vegetable substances, with a satisfactory result. There are a variety of carp known to fanciers in Europe: one variety without any scales at all, which obviates the necessity of scaling them for cooking; another variety has a row of scales. There are several varieties of carp fully provided with scales. There are two distinct species; one of which, by its multiplication in Europe, has thrown a great deal of discredit upon the other. One of these fishes is long and unpalatable, but very largely cultivated. The true carp, cultivated in Germany, is a different fish, and has certain merits that commend it to the attention of fish culturists. I have made several efforts to obtain a sufficient supply of these carp, but, unfortunately, twice owing to the storms and the exacerbation, they have been lost on ship-board by the swashing around of the fish in the tank and other causes. I have a few, brought in by a late importation, which are in charge of Mr. Ferguson in Baltimore.

Another fish, of which we have a small number to start with,

is the tench, a special variety of the European tench, which has many qualifications for a desirable fish. One is extreme hardihood, and the other its ability to resist the desiccation of the ponds. It can be cultivated in any mud-puddle, and when it begins to dry up the fish buries itself in the dust, and the surface may become perfectly hard, so that you can drive a wagon over it; and if you want a fish you can take it out with a spade; yet when a rain comes the fish will wiggle their way out, and there they are. It grows with great rapidity and to a large size, not unfrequently weighing ten, twenty, thirty, and even forty pounds. Both the carp and the tench make flesh a great deal more rapidly than any fish we cultivate. They are vegetable eaters, and that is one great advantage over the trout, the black bass, and other fish which are cultivated in limited enclosures. Give to them a certain quantity of plants—rice, Canada wheat, water-cresses, and the like—and they will find in them all the sustenance they require. If you wish still to feed them, throw in lettuce, cabbage, or other vegetable offal, which they will eat very readily.

The value, therefore, of the carp is very great. I never tasted it, but I have the statements of those familiar with its merits; they admit that it is not as good as salmon or mackerel, but they can be raised by anybody, and they are especially adapted to the warm parts of the United States. The great want is a fish that can be brought into the mill-ponds and warm streams of water of the Southern and Gulf States, where the trout cannot be introduced. The warmer the water the better the carp thrives, and the best results in carp culture in Europe have been in ponds connected with low pressure steam-engines, where the water is at a temperature of 90° to 100°, and in those ponds the carp grow with abnormal rapidity. I have been told that in a single year they have been known to make over four

pounds in weight. The carp is also a very hardy fish. You can easily transport it. I have heard of cases where carp have been kept five days out of water in damp moss. This is an advantage in favor of distributing them. I therefore hope, as a result of the new experiments now being made in Central Germany, the results of which are to be expected here in April next, to be able in a few years to supply breeding-carp in a great many parts of the country, and perhaps in ten years it may be as common here as in Europe.

Mr. WILMOT: Do you say that the carp is well adapted for mill-ponds?

Prof. BAIRD: Any sluggish, stagnant water. It does not thrive in spring-water.

Mr. WILMOT: Would it suit the disposition of gentlemen who have ponds and small streams? Are they not desirous of combining fish well adapted for food, and at the same time having gamey qualities as far as sporting is concerned? Would they consent to introduce a fish from which they could derive no advantage themselves, except from their marketable value, when they are a very inferior fish for the market, being inferior to trout.

Prof. BAIRD: Our great object is to increase the amount of animal food in the country, and it is purely a matter of cookery to make it palatable. If we can introduce a fish that asks no favor in the way of food, and that will furnish, as I am creditably informed, 1,200 pounds annually to the acre, that is a great deal better fish to have than many that we now have.

Mr. WILMOT: That is, by giving them additional food?

Prof. BAIRD: Without feeding them at all. I am told that it is not an uncommon thing for the ponds in Germany to furnish annually four hundred carp to the acre, each carp weighing

three or four pounds, which sell for about a quarter of a dollar in the German markets, without the slightest difficulty.

Mr. WILMOT: Do they live upon one another?

Prof. BAIRD: No, sir; they live together like a flock of sheep.

Mr. WILMOT: I cannot conceive how this large carp can grow in ponds merely from the vegetation they will find.

Prof. BAIRD: The more the carp lives upon the vegetation, the faster it grows. There is one gentleman in Austria who has 26,000 acres in carp ponds, and it constitutes an element in a very large fortune to him.

A MEMBER: Is not the vegetation in the Southern States more luxuriant?

Prof. BAIRD: Yes, sir; it is.

INVITATION TO A DINNER.

The President introduced Mr. Coup, who thanked the members for the honor conferred upon him by electing him as an honorary member of the Association, and invited them to a dinner this evening at 8 o'clock at the Gilsey House.

SHAD FISHERIES.

The President called upon Prof. Milner to give a further statement with regard to the United States Commission.

Prof. MILNER: There is very little more to be said beyond what Prof. Baird has stated. When the shad culture commenced we were associated with Mr. Ferguson in Maryland. Instead of getting our entire supply of eggs from one fishery, we were able to get them from a large number; but the shad do not seem to have the disposition to come up the streams unless the temperature is as high as 68° or 69° and from the want of rain the streams have been very low. We succeeded in obtaining

about 600,000 eggs from the Potomac. Later, Mr. Ferguson established a station in the vicinity of Havre de Grace, where there were hatched about three or four million. Again, in the Connecticut, at Holyoke, we had bad weather in that direction. The temperature got to be very high in July, so that the water of the Connecticut reached the temperature of 86° which is entirely too warm for any success with shad. The eggs died in the boxes, but the work began again and was carried on until August 5th. The distribution was not near as extensive as it would have been if we could have got the supply of fish-eggs that we needed. There were altogether seventy-two or seventy-three applications from members of Congress, governors of States, and citizens from all parts of the country; and we made about thirty-one or thirty-two shipments of shad. The most extreme southern point was in Louisiana; the most northerly point was in Connecticut; and western, we went to the Des Moines River, where the success of the shad fishery has become thorougly established. The first shipment made there was made under the auspices of the California Commission, by Seth Green, in 1871, Since then the United States has made two shipments, and every year we have taken more and more of those shad. There is no mistake about the identity of the fish, because specimens have been preserved and carefully examined.

Mr. Wilmot: Have any of your researches extended as far as the Bay of Fundy, with regard to shad?

Prof. Milner: No, they have not.

Mr. Wilmot: It is the intention of the Canadian Government to produce shad in that section of the country, but the inhabitants say that the shad do not breed there at all, and only come there for breeding purposes. I wish to get information before we commence operations.

Prof. Milner: My knowledge extends only as far as the

Androscoggin. I know they are taking the spawn there, and while there, in 1874, we did not obtain any quantity of eggs. Still we got a great many fishes, and they are said to have been found in the St. Lawrence.

Mr. WILMOT: If we can produce large numbers of shad in that section, it will be equally beneficial to some portions of the United States.

Prof. MILNER: It requires a very large catch to make any success in getting eggs, because the per cent. of ripe fishes to fertilize is very small in a catch. In three or four hundred shad you will perhaps not find more than two or three or four spawners.

Mr. WILMOT: Is not that because they have not gone sufficiently far up the river?

Prof. MILNER: It was so in the Connecticut, where they had got to the end of their course.

Mr. WILMOT: What period of time will the shad-spawning season cover?

Prof. MILNER: It differs on different rivers. On the St. John, in Florida, and in the Savannah River, it is in February: the Washington markets have had their supply from Savannah for two weeks past; in March shad begin to run into the Potomac, and in May and June they are spawning; in the Hudson the season is still later, usually closing about the 1st of July; the 18th or 20th of July it begins in the Connecticut, and extends up to August; so that the farther you go north the later the season is.

ELECTION OF OFFICERS.

The Committee on Nominations reported the following as the officers of the Association for the ensuing year:

President—R. B. ROOSEVELT.
Vice-President—GEORGE SHEPPARD PAGE.
Treasurer—EUGENE G. BLACKFORD.
Secretary—BARNET PHILLIPS.
Executive Committee—H. J. REEDER, FREDERICK MATHER, ALEXANDER WITCHER, SETH GREEN.

The above officers were accordingly elected.

CALIFORNIA SALMON.

Mr. LIVINGSTON STONE said:

Before saying anything with regard to the California salmon, I would say, with regard to the shad which Mr. Milner mentioned as having been sent to California, that there is no doubt that some of them have been caught there fully grown. I have seen two of them myself, preserved in alcohol, and there is no question about it that they are the shad of the Eastern States. Besides those two there are a great many more, and I have no doubt that hundreds of shad have been caught in California of which we have heard nothing.

With regard to the California salmon we are gaining a little every year and getting things upon a better basis. When I first went out there, in 1872, I succeeded in sending East 30,000 eggs. Year before last we took there nearly 9,000,000. In all, we have taken about 25,000,000 eggs from California salmon; most of which have been sent East, but a part of which we have returned to the head-waters of the Sacramento. Those 25,000,000 salmon have cost one dollar a thousand, in gold, up

to this time. After this we can get them a great deal cheaper, probably for seventy-five cents or half a dollar a thousand. I think that for $5,000 we can get 10,000,000 eggs and pack them for shipment.

There is one feature that may be worth mentioning. We have in our operations this year sent California eggs to New Zealand. It has been considered quite impossible to get the salmon eggs safely across the equator, and get them introduced into New Zealand waters; but this year we sent five lots of 80,000 each, 400,000 eggs, to New Zealand, and every lot, without exception, arrived in capital order. We sent 8,000 to Wellington, and we have sent them to many other points. It seems to me that California salmon-eggs must be very hardy, considering what they have to go through. In the first place, we have to pack the eggs on a warm day, because the salmon spawn in warm weather. Then, after being packed, they are taken twenty-two miles over a rough road under a blazing sun. The day I came away the thermometer stood at 104° in the shade and 125° in the sun. After they get to the railroad terminus, they are taken three hundred miles to San Francisco, and there they stay two nights and a day, and then are carried to the steamer, and then are carried by the steamer seventy-six miles, most of which is through the tropics and across the equator, and at the end of that distance are taken out; and I think it is perfectly surprising that the eggs of any fish whatever can be carried so far under such unfavorable circumstances and come out alive. In this instance they have succeeded well.

There is one more feature in this year's operations, and that is shipping the eggs across the continent in a refrigerator car. They have before been sent by express, and although they have come in pretty good order, it has been very expensive. This year the eggs were all put in one car, the surplus room in which

was filled with ice, and this car was taken to Chicago without being unpacked; and there they were taken out of the ice, and the consequence was that they were all taken out in good order. Besides this, this method has saved the United States Fish Commission about $700, and saved the consignees about $700—saving to the various fish commissions about $1,400.

When I first started there I found it necessary to put the hatching-troughs close to the water's edge, in order to get fall enough from the river to get hatching-water, and consequently every fall we had to tear up all the hatching-troughs, and the next spring to put them all down again. Last year I put up a permanent hatching-house, quite a solid structure, above the high-water mark, and put in a large current-wheel, which pumps the water up from the river and takes it through a flume; and in this way I hope to save the trouble and expense of tearing down the troughs every fall and putting them up every spring.

Prof. BAIRD: One word with regard to the California salmon. In 1875 Mr. Stone was authorized to give a small number of the eggs to the New Zealand colonies, and that lot of eggs was divided into two, one part of which hatched out very satisfactorily, but the other failed. In 1876 that experiment was renewed in New Zealand. I have heard from all those consignments now, and in every case success has been triumphant—not less than 75 to 90 per cent. of the eggs have been turned into healthy, vigorous fish. This is a great triumph for our California salmon, in view of the fact that so many pounds sterling had been expended in trying to introduce the Scotch salmon. They had succeeded in introducing the carp and the tench, but the salmon they had not succeeded with. All the experiments in Australia, and those in New Zealand, had failed.

This year I have had applications from all the colonies of Australia, and all in New Zealand, and from Chili, and other places, for eggs, which I hope to furnish, they paying all the necessary expenses attending it. Of course it would not be proper to use the money of the United States in presenting those eggs to foreign nations; but the capacity of the salmon is so great that, after meeting the calls of the State Commissioners, there are millions which we can dispose of in this way in the interest of humanity, to be distributed all over the world.

Mr. WILMOT: Prof. Baird has said that the Bucksport experiment had been abandoned on account of its expense. I hope that is not to be the end. I should feel inclined to give you some experiments I was engaged in last year with regard to the new mode of retaining fish in salt water. The eggs matured equally well in salt water as in fresh. Of course it is well understood that for many years back, in fact for centuries, naturalists have held that there was a necessity for salmon to go to fresh water to mature their eggs. Last season I was under the impression that the eggs of the salmon would mature if kept in salt water as well as in fresh, and, in order to illustrate that, I instructed one of my assistants to retain in the salt-water pond a few parent salmon, while I put the rest in fresh-water ponds; and he did so, and took the eggs from them at the same time. There was no perceptible difference noticed in the hatching of the eggs from those fish last year. That being sufficient for me to go upon, this season I retained fifty or sixty salmon in the salt-water pond. The eggs matured just as well as those of the fish in the fresh water. They were manipulated, and showed as much vitality and life as those in the fresh water. They were hatched in fresh water, but the fish were kept in the salt-water cove. Therefore, to a certain extent, the expense of the Bucksport establishment might be saved. I think there the fish are

taken from the salt water and taken to the fresh water, and kept there at a double expense.

Prof. BAIRD: The establishment is still kept there, ready to be opened whenever the Commission require. We have thought it best to intermit for a time the experiment there, in order to see if what we did actually made any impression.

Mr. WILMOT: The salmon very seldom die in salt water, whereas in fresh water there is a fungous growth upon them, from which many of them die.

Prof. BAIRD: There is very little trouble in Bucksport from that cause. The pond is very large, and they remain healthy.

Adjourned until 11 o'clock to-morrow.

NEW YORK, February 15, 1877.

The Convention met at 11 A. M., pursuant to adjournment, and was called to order by the President.

The first business in order was the reading of a report by Mr. Mather, at the close of which the President announced that remarks from the members were now in order.

Mr. STONE: Mr. President, now that there seems to be a lull in the proceedings, I would like to ask our friend, Mr. Wilmot, to give an account of his method of impregnating the eggs of salmon. I believe he has adopted a method which, as far as I have heard, is entirely new, and I should like to hear something about it, and I think other members of the Association would also.

Mr. WILMOT: Mr. President, in a private conversation a moment ago with my esteemed friend at my left, Mr. Stone, the subject arose in regard to the matter of impregnating eggs, and I asked Mr. Stone how he did it. He said he did it in the usual way, namely: after mixing the milt with the eggs, they

were allowed to remain a certain number of minutes, and then were taken and distributed upon the trays. I replied to him, "I have adopted a new plan this year, and I have found it to answer admirably, and infinitely better than the one I have practiced hitherto." I formerly practiced the same system that I allude to, namely, taking the eggs from the fish and putting the milt upon them, and then allowing them to remain twenty or thirty minutes. The system I have adopted this year, I think, will be conclusive in itself as showing the benefit that we have derived from it and the amount of labor saved. The system that I have adopted is this: we take the female fish out of the water and strip her as rapidly as possible; perhaps two or three fish are taken out one after the other, so that in some instances we will have nearly a gallon of eggs—a half of a gallon any way, or three-fourths of a gallon—in one vessel. We then take the male fish and begin stripping him in a like manner to get the milt. An attendant is standing immediately alongside of the other gentleman who is manipulating. He has a measure which is calculated to hold a thousand or two thousand, as the case may be, and he stands immediately alongside and dips these eggs out as rapidly as possible and puts them on the breeding-tray, and the breeding-tray is put in the hatching-trough. In that way I have impregnated a larger number of eggs by far than I have in the last seven years in which I have been engaged in this work. It is simple in itself, and so different from what has hitherto been practiced, that I thought it advisable to mention it here, because it is so much better than any other system I know of.

The question may arise, "How is it possible that these eggs become impregnated?" My impression is that impregnation is instantaneous under all circumstances; it is instantaneous or else not at all; therefore when the eggs are taken from the

female fish, and the fluid put upon them, the sooner you lay them down in that state upon the trays and do not disturb them afterwards the better it is for the eggs. That is the system I have pursued, and I think if you will adopt it you will find it superior to anything yet practiced. I have found it so. In laying down some four or five million eggs this year that is the system I have practiced; and I have sent word to the various establishments over which I have control, telling them to do the same thing. Some did not do that way, some did. Those who carried out the plan I have now laid down have succeeded better than those who did not. With regard to my own establishment, I have carried that out to the very letter, and out of a million and a half or a million and three-fourths eggs I don't think that I have lost one per cent. up to the present time. That is my success. I think it is the duty of those engaged in fish-breeding to give as much knowledge as they possibly can to their fellow fish-breeders upon this important question, and I think, under the circumstances, that you will find that the system that I have practiced this year will be very satisfactory and productive of a great deal of good in the science of fish culture.

Mr. Blackford: Mr. Mowat stated that he had kept the milt of the male salmon several days and then used it successfully. I don't recollect the number of days in detail. Perhaps that might interest the gentlemen here present.

Mr. Wilmot: Several experiments of that kind have been tried by my assistants in the lower Provinces. In some cases the milt has been carried a long distance—in one case I think two or three hundred miles in small vials. The vials were put in cold water and conveyed to the hatching-house where they had an abundance of female fish but no males. I have not yet heard the result; it has not been reported to me, and I fancy from

not having received a report of it that it is not satisfactory, because, generally, when things are very satisfactory, my assistants are in the habit of sending information to me immediately, but up to the present time I have not received any report from them. However, as we are speaking upon this subject, I will give you an experiment that I have tried myself. I have carried the milt of a male salmon-trout about forty miles. I carried it in a bottle, and I have put it upon the ova, and I produced a hybrid or cross-breed fish from that mixture; so that, to a certain extent, it is true that you can carry the milt as a matter of fact. I would not advise it in all cases, for I think that the sooner the application is made the better.

Mr. EDMUNDS: The theory in regard to the instantaneous impregnation we have verified in the statement of Dr. Hastings of Hartford. He claims that he put the egg of a fish under a microscope and the milt was put on to the egg, and he said the cell-structure changed so suddenly that he could not tell when it took place—that it was perfectly instantaneous. The whole cell-structure of the egg changed.

Mr. MATHER: I have seen it in the shad, but I did not find it instantaneous under the microscope. I found it took perhaps eight or ten minutes before you could see the first line drawn through the egg—the first subdivision. As you are all aware, it subdivides into two, and then into four, and the lines keep crossing in that manner, and I think it was fully from eight to ten minutes before we could see this change in the shad-egg, and the development of the shad-egg goes on so much more rapidly than the salmon that I should think the salmon would take considerable time in order to see it. The shad hatches quickly; the whole fish is formed and ready to hatch in from three to four days, and the same amount of development will take the salmon fifty to sixty days, or more.

Mr. WILMOT: If our friend had stated that he experimented in this way upon a striped bass, we would have been much more likely to believe his theory. He says it is done in stripes, one stripe made and then the rest. I am under the impression that it is instantaneous; that the moment the impregnating fluid enters it is instantaneous. It is not in parts, and they coming together afterwards and forming a body, but it is instantaneous.

Mr. MATHER: It may be instantaneous, but I meant, to get any result that you could see. You can tell an impregnated egg long before the fish is perfectly formed, as every one of you are aware; but with a trout-egg it will take some days—perhaps eight or ten—and then you have got to take a little vial and hold it up in order to see those lines. It is the lines that you see that gives you the idea whether the egg is impregnated or not, and it is so with the shad before you can even see it or be aware of it.

Mr. WILMOT: I do not mean to say that certain parts do not come together for the purpose of forming the yolk-sac, but I mean to say the substance which gives vitality and life is of that minute form, and gives life instantaneously. That is the argument I hold.

Mr. MILNER: Von Baird, the Russian embryologist, who has within a few weeks died, in making studies of the eggs of fishes, found that on one side of the egg was an orifice which he termed a *micropia*, and he, under the microscope, in impregnating eggs, saw the *spermatozoa* enter the *micropia*. Now what the physiological action is nobody knows, but the process, so far as that is concerned, has been followed. They have seen the *spermatozoa* enter the orifice in the egg. The next stage seems to be, the egg is so constructed that it is formed in concentric spheres. There is the inner yolk, the *vitellus*, having around it a coat, and then outside of that is the outer coat or shell. After

the egg is impregnated, the water enters the *micropia*, swelling the egg, and spreads the outer shell—extending it. The inner sphere remains the same, the water entering between the two coats extends the outer shell and enlarges the egg. So far as the mere conception is concerned, that is, as far as they have been able to observe, all that they know about it. This action taking place is subsequent. I should imagine that in fishes like the shad, which hatch in three days, that the whole development process would begin earlier, and of course it goes through much more rapidly; while in a salmon, in water of from 32° to 35°, it would hatch out in about five months.

Mr. WILMOT: Then the inference to be drawn is that this *spermatozoa* enters the womb, and then the formation that goes on in the egg is the collection of the fatty substance to feed the living object that has gone into the egg.

Prof. MILNER: That is what we do not know. That is assuming all the physiological action.

Mr. EDMUNDS: Don't you believe that impregnation in the natural process, in a running brook or in a race, must be almost instantaneous where it is naturally deposited?

Mr. GREEN: Yes, I believe that it is. It strikes *there* [illustrating], and keeps striking, and by-and-by it goes in *there*, and that is instantaneous, but it is not until you get it there. That fellow has got to find that place.

Mr. EDMUNDS: You think it is liable to accident?

Mr. GREEN: It is liable to accident, of course. Here is a ball floating in the water, or in the air, or what not, filled with all these little animalcules crawling all over it, and they might not light right on to that hole, or strike right into that hole, at one time. I believe that impregnation is caused by one of those little insects getting into the channel and seeking the proper

place, and when it is there it is nourished and fed and grows, and that is the animal. The same with this.

Mr. EDMUNDS: In one sense you do not claim that as really accidental, and in another sense it may miss.

Mr. GREEN: Twenty-five per cent. used to be allowed for impregnation of eggs. The reason was that there was so much water in it that the animalcules were not thick enough. They were not thick enough in it to find a hole in the egg. When we came to thicken it up, as I did four or five years ago—and I didn't tell Mr. Stone of it either for four or five years afterwards—my eggs impregnated then.

Mr. WILMOT: Friend Green says there is no advantage in this process. I have forgotten the great advantage that there is in this speedy mode of laying down the egg after it receives the impregnating fluid. In my establishment we will manipulate one hundred salmon at one time, take a hundred salmon out of the water as rapidly as we can and manipulate them. If the old system was pursued we would require perhaps fifty tin pans or vessels to lay these eggs in for thirty minutes. We would have to have the whole building strung with a lot of tin pans with these eggs to carry out your system of twenty or thirty minutes; whereas, in this system we gain a great deal because we only use one or two pans, and as soon as one is full we dip them out and put them on the breeding-troughs immediately.

Mr. GREEN: Your tray is standing in the water when you put them on?

Mr. WILMOT: No, it is not.

Mr. GREEN: That is not my experience. We have a trough with an inch of water in it. I am speaking of our hatching-house. We take the spawn, and as soon as we have taken what we want in one pan we set that in the trough in the water. It remains there until we get all through taking spawn. At that

time those that were taken first are ready to put in the hatching apparatus, and I really do not see any advantage unless it is where you have them by the bushel.

Mr. WILMOT: It is the speediest way by all means to do, and I think if you try it once you will be a convert.

THE PRESIDENT: Do you pour them right into the trays dry?

Mr. GREEN: No; my version is that you cannot handle them too carefully, and that there would be a great many less spawn killed provided they had a little thin shell on them that you could see when they were killed—when they broke. A salmon's spawn will stand more than any other, and whitefish and shad less than any of them. I think that to pour any of them into a dry tray that you would have a good deal of picking to do in the course of ten or twelve days.

Mr. WILMOT: We laid down several millions of eggs this year, and that is the system we pursued.

Mr. MATHER: Just as soon as this little animalcule, or *spermatozoa*, enters the egg, if the theory is correct that the egg immediately closes, how then can we account for the production of double fish? We have two perfect fish often in one egg, joined on one side, and sometimes with two heads. The question is whether more than one of those entered in order to accomplish that.

Mr. GREEN: There is such a thing as two of anything getting into a hole at the same time.

Prof. MILNER: Multiplying the number of *spermatozoa* that enter the eggs would not have anything to do with making twins. That relates entirely to the double yolk or to the two germ-spots, perhaps, in the egg. In all the elementary works on anatomy they give illustrations of the egg of the squirrel after impregnation, and in a number of instances there were as many as a dozen *spermatozoa* that had entered the outer coating and

were found fastened upon the inner sphere. Two *spermatozoa* entering an egg would not make a double fish or Siamese twins, as we see frequently, but the egg must have been a double-yolk egg, or with two germ spots more likely.

Mr. GREEN: There is a great deal of force in that—in its being a double-yolk egg. A double-yolk egg would do it, and that I should think would be the natural cause.

Mr. EVARTS: This discussion seems to have been brought about by the difference of the two things that are spoken of. Mr. Wilmot spoke of the impregnation of the egg, and Mr. Mather of the growth of the *spermatozoa* after it got into the egg. Impregnation, physically, through all animal life, must be instantaneous. The amount of *spermatozoa* that are in semen is sufficient, so that the first one that finds the egg will get there as quick as he can. The number is so great that they do not stop a great while to find it, and the first one that gets there gets in. That is instantaneous throughout physical life.

Mr. EDMUNDS: Mr. Green's idea in regard to the age of the animal is well understood by physiologists, that where an undue amount of sexual intercourse has taken place with any animal in early life they very soon become unfit for use. It is well known among horsemen and farmers that a horse that is used too much when he is two or three years old, will be spoiled for impregnation; and so also with the bovine family; and it may be that it is due to the cutting off of a portion of the *spermatozoa* that he speaks of.

Mr. STONE: I would like to ask Dr. Edmunds if Dr. Hastings, whom he referred to, has published any of his observations.

Mr. EDMUNDS: No; it was in a casual conversation that I had with him in regard to the matter, and it is well known that the cell-structure in an egg changes almost instantaneously after the passing in of the *spermatozoa.*

Mr. STONE: How is that known? Who are the authorities?

Mr. EDMUNDS: I only state myself, from the personal conversation with Dr. Hastings, in which he said that the cell-structure was so suddenly changed that it was impossible for him to distinguish when it occurred, and he considered natural impregnation as the same, that it was instantaneous in the running streams, and that the *spermatozoa* found a foramen in the egg and entered it instantaneously; that there was no doubt about it at all.

Mr. WILMOT: Prof. Agassiz investigated the speedy mode by which a whitefish-egg becomes impregnated. He says it is almost instantaneous, and he says almost immediately afterwards it begins to grow. almost instantaneously; and he gives you a description of that almost every hour afterwards until several days have gone by. So I think these scientific men have indorsed the theory which we have laid down, that it is instantaneous. The immense quantities of *spermatozoa* that are taken from one male fish are almost innumerable, and the moment they get where the egg is one of them enters, and that is instantaneous.

Mr. GREEN: I claim that it takes time to do anything, and if it takes time, it is not instantaneous. He gets in as quick as he can, there is no doubt of that, but it is not instantaneous; it takes him a little time to get in.

Mr. PHILLIPS: I wish to ask Prof. Milner if he has not made microscopic examinations of eggs immediately after impregnation?

Prof. MILNER: I have made none that I can refer to. I have watched the development, but it is a critical thing to do, and unless a person has had considerable training as a student in embryology, they do not know precisely what they see. In using a microscope it takes a certain amount of time to get

familiar with it, and to know positively what you see. I have heard professional microscopists remark that frequently; and embryology requires the same critical, trained eye to follow the processes. The work that Mr. Wilmot speaks of gives illustrations of the condition of the egg, and it shows the segmentation and gives the whole process.

Mr. STONE: I think it is perfectly well established that the results of impregnation—the first furrowing or segmentation of the egg—is very slow and gradual. I think there is no doubt about that. The results of the impregnation are slow and gradual, and in a salmon-egg the very first furrowing only takes place after twenty-four hours; and if I understand Dr. Edmunds rightly when he speaks of this instantaneous change which takes place at the time of impregnation, he means something that is different from the segmentation, or the furrowing, or any of the results of impregnation. He speaks of the instantaneous change in the cell-structure of the egg.

Mr. EDMUNDS: Yes, sir.

Mr. STONE: And that is the thing that I would like to get at.

MR. EDMUNDS: It is a thing that I have never experimented with, but it is well established.

Mr. EVARTS: That instantaneous change, I should say, probably, judging from the impregnation, would be the closing of the orifice through which the *spermatozoa* had entered the egg, and it would keep any other *spermatozoa* from entering.

Mr. PHILLIPS: Mr. President and Gentlemen: It is from rather a high and scientific standpoint that you have been speaking, and perhaps the matter which I would like to bring to your attention may not be as lofty, but still it is one which interests me exceedingly. The discussion which has just been had is very interesting to society, and so far as it tends in one way or the other to determine how long milt can be carried,

therefore it is exceedingly interesting to me. Would it not be possible, at the next meeting of this Association, for such a scientific subject to be more thoroughly studied in this Aquarium? Would it be possible for you, Mr. Mather, to examine carefully the action of milt upon eggs, and by carefully watching it to determine how the increase is formed?

Mr. MATHER: It might, if we had the spawning-fish here, but there are very few here in the Aquarium that will spawn. We intend to do everything we can do in that way. I hope this coming season to take some eggs of some salt-water fish that have never been taken, and if I carry out that intention I may do something of that kind. I have done very little microscopic work, and that that I referred to awhile ago as watching was done by a very fine worker, Dr. Shafer of Washington, who is well known in microscopic work; it was with him that I observed these things and learned many things about impregnation. I have done but very little of it myself. I am studying it, and I hope to arrive at some results by-and-by.

Mr. PHILLIPS then read an article upon the Centennial, and upon the value of different kinds of fish as food, as follows:

GENTLEMEN: There are certain topics which are everlasting. Being everlasting, they are monstrously tiresome. When an endeavor is made to explain such topics with any degree of amplitude, they may be listened to for the moment with some amount of attention, but it is very doubtful whether much immediate effect is produced. We get around the long explanations of things which are self-evident by inventing certain brief, pithy sentences, which we call proverbs. We say "time is money," which has been often twisted into an idea of this kind, "that time or credit is money." Another well-known saw is "waste not, want not." No man ever did take these few words

exactly to himself, but deems them applicable entirely to some one else. Advance this idea of waste more particularly in regard to fish, and the generality of people will say: "Oh! of course it is quite true. That is to say, we have not the least doubt but that it may really happen some day or other, this want you speak about, but what business is it of ours? When the trouble comes this man is talking about we shall not be here, you know. It will regard the men who are to live and eat some fifty or a hundred years after us. That is their look-out, you see, and not ours."

What struck me then most particularly at the Centennial Exhibition—something which pervaded me all the time, which was always the most prominent—was this idea of American waste. I mean the immense quantity of good fish, intended by the Almighty for food, which was despised and thrown away by us in this country. I must confess that my own studies have been for the last few years more particularly directed towards the preparation of fish as food, and at the Centennial an opportunity was allowed me of comparing the preparations of our own country with those of other sections of the world. One thing which was apparent was the meagre list of our own fish preparations. Mind you, I do not mean as to quantity. When we think that the Columbia River alone furnishes fully three times more canned salmon than the whole catch of salmon in England, Scotland, Ireland, or Wales, we can say nothing as to quantity. But quantity is not always quality. What I took the liberty of suggesting, in a brief paper read by me in Philadelphia some months ago, I have to repeat now, and that is that in our fish preparations we are monotonous. When we have said cod, mackerel, herrings, shad, salmon, and whitefish, we have entirely exhausted our list of fish preparations. We seem from custom or habit to be pent up within certain limits. Now I do not

mean to advance the idea that these preparations are not excellent of their kind, but they always run somehow in one particular groove. We stick to one or two kinds of fish, and refuse to go beyond them.

Talk about prejudices! There cannot be found any people who, in a piscatory view, have such a narrow horizon as ourselves. Now let me give an example of what I mean, derived from some absolute facts which were apparent at the Centennial. Little Portugal exhibited no less than sixty preparations, derived from twenty fish, while America was represented by fish derived from only ten kinds. Now I will cite our own. We used clams, cod, eels, herrings, lobster, menhaden, mackerel, salmon, oysters, and turtle. Now Portugal gave us bream, cockels, eels, herrings, lampreys, mackerel, mullet, mussels, pilchards, sardines, anchovies, salmon, shad, sprats, soles, sword-fish, squid, salmon-turbot, and tunny—some twenty-one kinds of fish, not counting some half-dozen others—the names of which so far untranslatable—we are awaiting the identification of from Portuguese icthyologists. Now remember, too, that from the warm seas which bathe Southern Europe the Gaddidæ are not found in the list.

Now, referring again to what I had to say in Philadelphia before the Convention then, which I must repeat again to-day, it is this, that although as to the implements of fishing, such as our lines, nets, traps, hooks, we can be taught nothing from the Old World; as far as their preparation of fish-food goes, we have everything to learn. I again insist, then, that we have in this country an avalanche of fish-food, admirable of its kind, which we disregard. I do not refer even as much to the fish which might be prepared for future use, but to fresh sea-fish, to be consumed at once. Now, for example, who ever in this country thinks of eating a skate or a ray. Sometimes you will find a

magnificent skate hanging from the hooks at Mr. Blackford's establishment in Fulton Market, and people look at it as a curiosity. The idea of eating it never enters their mind. And pray, why is it not eaten? The very stupid answer is given, "Because it looks so funny." "See its long tail and its ugly face." Funny! Some of you have undoubtedly seen in the Aquarium below these skates flying, as it were, like birds, with undulating swoops of their wings, through the water. Is there anything ugly about them, then? Compare a skate with a lobster—is there much difference as to looks? But in all these things handsome is that handsome does. Apart, then, from the appearance of the fish, did any of you ever eat a fillet of skate? Of course I do not think you could do much with the tail, but I assure you, that when properly cooked, a fillet of skate is about the most delicate fish-morsel you can eat.

Here is, then, the best of food, which we despise. Our fishermen catch them, and with an imprecation throw them back again into the water. And why? Because there is a stupid prejudice against them. But somehow or other you do eat them and you enjoy them, when you know nothing at all about them. There is more than one first-class restaurant in New York where a skilful French cook prepares skate with skill, and you eat it under the name of turbot, and you think it delicious.

Now there is the sea-robin—the *Prionotus Carolinus*. Catch anybody eating that! And why? Because he is mottled red and black, and has large pectoral fins like wings. Some two years ago I was fishing off Sandy Hook in a yacht, with a *delettanti* crew; that is to say, they were very particular as to what they eat. A chowder was a *sine qua non*, but no blue fish would rise; but we caught sea-robbins in quantity. Some one suggested converting the sea-robbins into chowder, which was done in secret, and a better fish for chowder purposes never was eaten.

Now of large and important fish there is the ling and the cusk. Both are admirable fish. Mr. Blackford tells me that some years ago he had a standing order for a fresh cusk on every Friday from one of the noblest *bon-vivants* in New York.

I can tell you, too, of another fish which I declare to you to be better than almost any other fish in the market, and that is the *Parephippus Quadratus*, or moon-fish. Always referring to our worthy Treasurer, I have his account for it, that some three years ago he divided up a barrel-full among the numerous New York hotels. Mr. Blackford gave the moon-fish away. Next day every hotel sent an order for moon-fish, and now they are in demand. Now there is the red-grouper, coming from Florida. There is some stupid spite taken against this really excellent fish which is quite the equal of the bass. Some years ago it was only the very poorest who would look at our flounder. It was called a mud-fish. To-day, in some respect, the despised flounder is getting into use, and thanks to French cooks, you eat it disguised as *fillet de sole*. There are sectional dislikes, too, which are curious. Now Boston and Nantucket delight in sword-fish, which is a sweet and excellent fish, much superior to halibut; but in New York no one will eat it. I could cite innumerable cases of this character where a fish only to be appreciated should be tasted. The other day, when visiting this Aquarium with an Italian lady, she noticed the sea-urchins. As she was a person quite celebrated for her artistic tastes, I pointed out to her the sea-urchins, indicating their beauty. Her impressions of their prettiness was only secondary to her appreciation of their excellence as food. "Ah," she said, "in Italy we think sea-urchins delicious as food. What, is it possible that in this country you do not know of this delightful fruit of the sea? And you call yourselves an intelligent people without prejudices!"

One thing is very certain, that it would be wise on our part

to look in every way towards the augmentation of our food supplies. Our national larder should be increased, and it can be done by a better appreciation of the bounties showered down upon us.

Now I by no means am desirous of seconding the ideas advanced somewhat at random by some enthusiastic admirers of fish-food, who say, "Give us a greater abundance of sea-produce, and we shall speedily record a fall in the prices of beef and mutton." If such a lowering in the price of beef was possible, it might of course be desirable. But beef in quantity is good, and so is fish. I think that in this country, as in England, the following paragraph, taken from a leading London journal, is quite pertinent in some respects to the situation :

"The present demand for fish, even with the great organization which now exists for its supply, can only be partially met ; nor can fish-food ever become so abundant as materially to affect the prices of our other supplies. At certain times throughout the year, when markets become glutted with the commoner kinds of fish, the price falls so as to be almost nominal ; but what is remarkable on the occasion of such gluts is, that however large the supply may be, it can readily be disposed of. By the aid of the telegraph, coupled with quick railway transit, such arrangements may now be made for the disposal of the largest supplies of fish as could not be entered upon fifty years ago, when the produce of the deep was asserted to be much more plentiful than it is at present."

There is this difference, however. Whereas in England their stock of fish is augmented by many varieties of fish, we restrict ourselves in this country to but few kinds. Englishmen and Scotchmen, rich and poor, eat fish we would turn up our noses at.

Among some new products which I noticed at the Centennial, there was one, of American origin, which excited the

particular attention of the Judges. It was an advance made in the proper direction—an admirable attempt to stop the fearful waste of fish-food. A gentleman in Maine had succeeded in utilizing as food, in its most concentrated way, the much-despised menhaden. A product had been made by him which in every respect resembled Liebig's extract of meat. It was of good taste and color, and without any fishy odor. Dissolved in water it was like a *buillon* made of beef. Here was a valuable substance, useful to man, giving muscle and brain—something worth dollars and cents—which heretofore had been thrown away; for one of the great advantages of this fish-extract was that in its preparation it did not preclude the extraction of the oil, nor the conversion of what was left of the fish into manure.

As the action of this Society is peculiarly conservative in its character, as it tends to the preservation of fish, I have thought that these ideas of mine, hastily put together, might give opportunity for thought.

No country under God's heaven has so much good fish-food furnished it, and in no other land do I think it is so wasted. If rich men with long purses only care to place salmon, trout, or pompano on their tables, there are many modest boards, where barely a scant meal is furnished, where variety of fish-food and plenty of it might be had if we were not slaves to very false and stupid ideas.

It is not possible that even the present degree of plenty I speak of in regard to fish can always last. When in fifty years to come New York will rival London as to population, when there are more mouths to feed and less to put in them, the lesson of "waste not, want not" will be better understood.

I think even if we were more icthyomniverous, and eat of more varieties of fish both derived from fresh and salt water,

the advantages fish culturists would derive from this would be very great. We should not then devote our entire attention and appetites to a few classes of fish. The supply might then keep nearer to the demand. There would be more breathing-time, as it were, allowed for the fish, which this Association is directing its attention to—those fish which, by means of artificial propagation, we trust to fill our streams with. In fact just now, from our tendency to waste, we are very much like children, eating our cake and wanting it all the time.

The President: In that connection, gentlemen, I might call your attention to the fact that some of you perhaps are not aware of, although I see some gentlemen around me who probably can go back in their recollection as far as I can; but in my early days such a thing as eating a soft-clam was unknown. Nobody ever ate a soft-clam at all. They called it a piss-clam. Now we all know it is infinitely better than any other clam, and ranks both in quality and price with the oyster.

Mr. Blackford: They are $2 a hundred for extra large ones.

The President: When I was a boy they were utterly worthless; no one touched them at all except some few colored gentlemen on Long Island. They seem to be the pioneers in such things; they eat horse-foot crabs, which no white man has eaten yet that I know of.

We have with us a representative from the other side of the water, a country that is celebrated throughout Europe as probably being the most productive of salmon of any there, equalling almost, if not fully equalling, our own streams—the country of Norway. I would be very happy if Mr. Walheim would favor us with an account of the fisheries of that country.

Mr. Walheim: Mr. President, I am not accustomed to use the English language, and it will be difficult for me to explain my thoughts, but I will try as best I can. In regard to the

question introduced by Mr. Phillips, I should think that we in Norway have some experience in it, because we have for over a thousand years had such fish, and we still have the same way of putting them up for the trade. We dry them as dry as wood, and we prepare them for the most distant countries as wood. The codfish is prepared in the northern part of the country in three ways. The oldest way is to dry them in the wind; another way is to salt them, and the third way is to pickle them; but this oldest one is not the best one, because the climate is not suitable for drying the cod. Then I should say the best way to furnish the market with fish was to try and send the fish as fresh as possible, and then instead of putting it up in several ways, to try and get it only in one way—fresh in ice. I have sent letters home about this matter, having seen Mr. Blackford's establishment, and I think he is on the right way; and the American trade in fish is better than the European, because they send the fish fresh to their customers, and leave them the choice to put the fish on the table just in the way they want it. If we send our stock-fish, or dried codfish, to Italy and to China and to South America, they have to dissolve it to make it soft in different ways—by means of ashes and water, by means of soda and all such things; and I guess this process may disturb some particles of food in it. In the mean while, if they had the fish fresh they would prefer it, and would have the whole fish more equal to the best kind of food. But, on the other hand, this pickling of fish and salting of fish is still necessary, because it it often, especially in our country, very difficult to have it fresh, and there is no other way to send it to the market than to salt it or pickle it. The reason why the Americans use so few kinds of fish, I think, is, in the first place, that they have so many that they use from choice only the best ones, and that in the next place the customers do not know what to eat. They have

to learn to eat fish as they do other things. They, for instance, in some parts of Norway do not know to eat mackerel. They are afraid of mackerel, because they say the black stripe alongside of the back is meat of the young creature, and they are afraid of that. Others do not eat eels because they are a kind of snake. But in the last year there has been a large alteration in that, and people all over Norway eat mackerel; they have learned to do it. I think if the American people would learn to eat all kinds of fish that are here in America, the fish trade would be larger, and the benefit very large also, because, as the Americans say, fish makes brains. We Norwegians say brains make fish, because to get these fish we have to use brains. But I think the question about that is a real business question, and the first one is to teach the people how to eat fish; and if any business man has customers that know how to eat the several kinds of fish, he also will know how to get the fish from the fishermen. In short, my opinion about the question is this, that we in Norway have learned that the best way to get customers for fish is to deliver the fish as plain as possible, without any preparation; and if you could send it fresh in ice I think we would prefer that to any other way, leaving to the customers and the eaters how to pickle them or how to cook them.

The PRESIDENT: Before you sit down, will you be kind enough to tell us the condition of the fisheries in your streams now, and whether anything has been done to keep them up?

Mr. WALHEIM: In Norway they have been very anxious to know the reason why the herring-fisheries are lost now, after having been going I do not know how many hundred years. The cod-fisheries, so far as our history goes, have been kept on in the northern part more than a thousand years, and there is no decrease or increase in it to be mentioned. Some years we catch 20,000,000, in other years we catch 30,000,000, and, I

think, in no year below 25,000,000, if we take all the dead fish. The herring-fishery has been very small in some years; just now in five or six years it has failed on the western part—what we call Springnelt—but at the same time we get a heavy catch on the northern part of the country, and of a little larger size. We call that the large herring. The difference between now and then is that the last year I think they caught 200,000 barrels, and some years ago they caught over 1,000,000 barrels in the whole. Because they do not know the reason, they do not know how to have any remedy for getting the fishery back again; and they have no law about the herring-fishery, except the size of the seines or the meshes in the seines, that they do not get too small fish; but they have the liberty to put their seines and nets wherever they want. They have a special police for these fisheries, both for the cod-fisheries and the herring-fisheries, but it is only to keep order, to stop the fishermen from going out when the weather is too rough, and to keep justice when there comes up any trouble. We have had some maps about the fisheries to show in which channel the herring is going into the country, thinking that if we could find the channel, and there find anything that would hinder them from coming in, we could have that removed, but, as far as I know, they find nothing. They found the herring in the depths of the ocean. They come to the coast to spawn, and then go out again; but the reason why they do not come now nobody can tell. Some say that the herring belongs to the deep-water fish, and only comes in to spawn. Others say that they belong to the coast-fish, and extend only a short distance from the coast, but the last acknowledgment about this matter is that the herring belongs to the ocean-fish.

There was an expedition last summer which had in charge to investigate the whole ocean from Norway to Iceland, to get

information about the temperature and the salt and a good lot of other things ; and one of them, who had a different opinion about it from other people in Norway, found out that as far as the vessel went to Iceland they could find herring ; and on the other hand, that not many miles off the coast they found no cod. Before that expedition everybody thought that the cod was to be found all over the ocean, and that they would not find the herring but a couple of miles off the coast. The principal question about the fish is how to take care of the fisheries, but the question has no real importance to us because we do not know the reason why the fish do not come. Upon the mackerel fisheries we have no laws at all. They can catch mackerel when they want to and can bring them to the market whenever they want to, and they have no control of the trade. They have not, as here in America, three sizes of mackerel. They have no marks on them at all. They generally send them fresh to the market in the country, and send them in ice to England. The fishery laws in Norway are only in regard to the fresh-water fishery, but the fresh-water fishery is very inferior to our salt-water fishery, and not worth mentioning at all ; but the fishery-laws about fresh-water fish are very particular, and nearly every year there is some alteration in them. There is a certain time by law to put nets in the sea, and at the same time we have a special law for every part of Norway. When we in our legislation have a law, it means a law for the whole country ; but in this law about fresh-water fisheries, they have a paragraph allowing one section of the country to alter it for their own use, in regard to the localities there and according to the opinion of the popula-lation in that locality ; and after having had meetings about it, they fix a certain time : for instance, two days in the week they cannot by law catch fish in some parts, and in other parts of the country they have fixed a certain size of the meshes, etc. But

this only belongs to the coast where the salmon-trout is going up and down the river. In the inner part of the lakes they have no laws, but there each owner of a farm which touches the lake has a right as far as not only the shore, but out in the lake. For instance, if the limits of the farm go in *this* direction [illustrating], and here is a lake, he owns the lake as far as these limits go, and if anybody catches fish here they have to pay him for it, and the laws only have that in view. There is another thing I would mention. They have a superintendent for the fresh-water fisheries, and he is to give his advice to all who want it about hatching; but they have no official connected with any public hatching-establishment, and if they want any spawn or any milt they have nobody to ask for it. They are in regard to that very inferior; they have nothing at all. The most important part of his business is only to look out for not disturbing the fisheries in the lakes. He is more of a policeman than a business man for giving advice in the trade.

The PRESIDENT: I desire to introduce to the Association Mr. Thomas J. Hall, who has taken an active interest in the protection of the Adirondack fishing and sporting in that section of the country.

Mr. HALL: Mr. President and Gentlemen: I was invited to be present here to-day by Prof. Mather, and I accepted the invitation with a great deal of pleasure, knowing, of course, as I did, that I should meet the scientific gentlemen of this country who are interested in the propagation of fish, and I can assure them that there are none who have taken a deeper interest in it than I have done. I have been a frequent visitor for the last twenty-five years in the Adirondacks in this State. Some two years ago I was up there in the spring of the year, and my attention was drawn to the fact of a band—I might almost call them, of gentlemen, as they called themselves

sportsmen—coming from Saratoga, Sandy Hill, Glenn's Falls, etc. I met them up at one of the head-sources of the North River, when we were camping there together, and I found they had been in the habit of going up there for years past, and that they took out some twenty odd thousand pounds of trout and salted them. I then conceived the idea why would it not be advisable to attempt to preserve certain portions of that district. I called upon the superintendent who had charge of the Adirondack Iron and Steel Works, who owned the property, and with him we formed a small club of ten or twelve gentlemen to preserve especially those ponds, the Preston Ponds, consisting of three ponds, good-sized sheets of water, and some 500 feet of land around. This year we have enlarged the extent of our Club very greatly, taking in townships 45, 46, and 47, of Essex county, containing as it does about 951 acres. This property belongs entirely to the Iron and Steel Company. It contains almost the entire head-sources of our North River, consisting of Lake Henderson, Lake Sandford, Newcomb Lake, Preston Pond, Lake Colden, Mud Pond, Boreas Ponds, Lake Calamity, and others. No doubt you gentlemen are all aware that the fish that we have had in that section of the country have been very limited, consisting only of the trout, the lake-salmon, pickerel, perch, and a few of the other ordinary fishes, and until we ourselves placed them in those waters last year, we had not a black bass of any description, nor had we any of the salmon at all. As soon as we concluded to preserve this large tract, I commenced a correspondence with Prof. Baird in regard to trying to procure certain fish to introduce into those lakes, and through his kindness he has presented to the Club about 5,000 of the California salmon, which he desired us particularly to introduce into Lake Henderson, which is one of the largest sheets of water we have. Perhaps some of you who

have visited this section know that lake; it is some two miles long, and perhaps a mile wide, and very deep, in some places, I believe, over 500 feet in depth, and very rocky. Prof. Mather has also presented the Club with the eggs of the salmon to introduce into Lake Henderson to see if we can propagate those fish. Although I can give you no facts in regard to the propagation of fish, I can assure the members and gentlemen here that we are going into this, we hope, in rather a scientific way. We intend this coming season to establish a hatching-house at what are called the Upper Adirondack Works, a deserted village containing a number of deserted houses. We intend to turn one of those houses into a hatching-house. We have now three keepers there, and with those keepers we intend, if possible, to preserve that section, and to introduce all the game fish, as far as possible, that we can.

I was requested by the members of the Club to state to the gentlemen here that, of course, all the privileges of fishing or hunting upon that section will have to emanate from the Club itself, but if any of the gentlemen at any time during the fishing season desire to visit any portion of that section we should be very happy indeed to extend them a cordial invitation, giving them the necessary ticket; and no doubt during the season they would meet some of us up there, and we should always be glad to extend them the right hand of fellowship in the good work that is going on.

I would particularly like to ask, Mr. President, through you, any of the gentlemen a question in reference to, I might say, the dying out of fish. In Preston Pond, some twenty-five years ago, when I commenced going up there, it was a common practice with me to take fish that would weigh a pound and a half or two pounds, and I have taken them that would weigh as high as three pounds, the ordinary river trout; but in the last five years

it is an uncommon thing to catch a trout that would weigh a pound. I would like to ask whether the cause of that has been from an excessive amount of fishing in the lake and not giving the fish an opportunity to grow, or whether it comes from their constantly breeding within themselves; and whether that deteriorates the fish at all. I would like to know that, because we have been consulting somewhat about putting in a new stock, and have rather hesitated doing it because the fish that we have in there is what we call the silver-trout. Seldom, if ever, will you find what I would call a red-bellied trout, but they are a long, slim trout, perfectly silvery on their belly; and we were under the impression that if we mixed any other trout, not knowing what they were, we might injure the fish that we have in there; and I would like to have any information given me upon that point, for, if it is advisable to cross the breed, Mr. Green, who has just stepped out, has kindly offered to give us from 20,000 to 25,000 fish this spring, to be taken up and put in there. I am much obliged to you, gentlemen.

Mr. Phillips: Mr. President, I wish the approval of the Association as to the nomination of an honorary member. When in Philadelphia we were signally indebted to a Japanese for a great deal of courtesy and information in regard to fish in Japan. This person, who was one of the Imperial Commissioners, had his attention directed towards fish culture, and he became in a very short time very thoroughly informed on these subjects, procured all the books, studied all the apparatus, and in an incalculably short period became in fact a clever theoretical fish culturist. He studied the idea with the intention of taking it to Japan. I think he would appreciate very much the compliment paid him if we were to make him one of our honorary members. The name of the Commissioner is Mr. Sekizawa Alkelkio. I have no doubt that in time some very

useful information could be had from that country in regard to the fish there. I therefore have the honor of presenting the name of Mr. Sekizawa Alkelkio as a person fitting to become an honorary member of this Association.

The motion being seconded, the question was put by the President, and carried.

Mr. WILMOT: I have neglected up to this time conveying to this Association the compliments of the Minister of Marine and Fisheries of Canada, and of the Commissioner. I have received a letter touching upon the subject, and I think it my duty to read to you a portion of it, which shows the interest they take in this Association. I do so in order to show the deep interest that has been expressed at all times by the Canadian Government in regard to the fisheries, and by the officials of that Government in aiding this Association:

"Referring to the circular notices of the Sixth Annual Meeting of the American Fish Culturists' Association, to take place at the New York Aquarium on the 14th and 15th instant, I am desired by the Minister to say he regrets very much that, owing to the Canadian Parliament being now in session, it will be impossible for me to attend, but he desires me to authorize your attendance. * * * Please be good enough to convey my most cordial respects to the fellow-members of the Association; and in mentioning to them my own regret at being thus obliged to forego the pleasure and profit of attending these meetings; do not omit to assure them of the warm interest I feel in all of their proceedings.

"W. F. WITCHER,

"*Commissioner of Fisheries.*"

I read this to you to show the continued interest and good feeling which our Minister of Marine and Fisheries, and our Commissioner as well, take in this Association.

The Treasurer's report was then read and adopted.

Prof. MILNER offered a resolution providing for the organization of sections, which was referred to a committee of three.

Mr. EDMUNDS read letters from David P. Rockland, Salt Lake City, Utah, and B. B. Redding, San Francisco, California.

Mr. HALLOCK: I suppose the gentlemen are all fatigued and tired of a continuous session, and would like to go, but I have got a little matter that I would like to present, following up this idea as to the variety of fish-food, and in relation to fish culture. During a residence in Canada of some years, I used to be very fond of fishing for sea-trout, because I thought they were more gamey than other fish, and I devoted naturally some little time to examining their habits. I brought the subject up here a year or two ago, perhaps oftener than I should, as to the identification of the sea-trout, more particularly because I thought it was so much more valuable than what I am pleased to call the *salmo fontinalis*. I thought if it was a distinct species, and its habits should be carefully studied, it would enter very largely into the notice of fish culturists, and they would pay more attention to its propagation, because the time will come when it will share the fate of other fish, and be run out and extinguished. I suppose there is an impression prevailing generally that this fish was the same—the *salmo fontinalis*, and what I suppose might be called the *salmo Canadensis*, and I have some specimens here that I would like to show. That fellow in the jar there is what I call a *salmo Canadensis*. It is a specimen of the trout caught in a particular river in Canada. They average four or five pounds. This poor fellow here has lost his color and shape; he has been in contact with alcohol, and faded out. It is very natural with men, as with fish, if they come in contact with alcohol too much, they change in that respect. But perhaps the characteristics of this fish are sufficiently marked to make it

appear different from the other, although I must say that when they came to me fresh, I could scarcely determine the difference between those river-fish, which are caught only at certain seasons, and those yonder, which are the brook-trout which have gone down into the salt water, and have been taken in salt water. Now in regard to my opinion : those who are Canadians know that the advent of the sea-trout is looked for by fishermen with some interest ; that in the middle of June the fish come up the rivers where we are fishing for the ordinary brook-trout—where we take salmon sometimes—and that they are so different in their appearance and in their shape and quality that they are very much preferred by the fishermen as commercial fish. When in drawing the seines the other fish are taken with these, those fish are thrown out as insipid and valueless for market, while these fish are carefully preserved and sent away by hundreds of barrels and salted. I maintain, from the fact that in this Nouvelle River, where these fish run—they are large, uniformly large—that it would indicate that they are a species peculiar to that river, precisely as there are certain salmon peculiar to certain rivers, as salmon-men all know, from the fact of their running occupying a period of only six weeks, after which they would disappear ; and that would serve to indicate a dissimilarity of habits between that and the other fish. I do not care much for the color. There are a great many children of one family that have a different shade in their color. Another point : I am very rambling, Mr. President, and not much given to consecutiveness. At the mouth of the Saguenay River, early in the season of these fish, in June, you will find on the bar outside, five miles from the shore, the fishermen there expect to find the fish then, and subsequently they work themselves up ten or fifteen miles, where there is another bar, and they are found there. Having been caught awhile, they disappear,

which would seem to indicate also that they were a seed-fish, seeking, as the salmon does, a certain river, or parts of the river, for spawning. Now if that be the fact, and the fish are preferable in quality to the *salmo fontinalis*, it is certainly worth the attention of the fish culturists that they may be induced to cultivate these fish equally with those inland fresh-water trout. In all the rivers and streams having access to the salt water containing brook-trout, I find that those river and brook trout will go to the salt water for change of diet and for better nourishment, but I do not think that it follows from that that they are identical with the sea-trout. The point I want to make is simply this, that if they are better than the brook-trout, we ought to pay more attention to their preservation.

Mr. HALLOCK offered a resolution thanking the proprietors of the New York Aquarium.

Mr. BLACKFORD: In seconding the motion, Mr. President, I feel that I ought to say a little more than is expressed in the resolution: that, as the resolution expresses it, this Association had the honor of first calling attention to the necessity of an Aquarium in New York city, and it was hoped that a public enterprise might be started which would be a free, public resort, somewhere in the neighborhood of Central Park; but as the time was not propitious for such an establishment, our friend, Mr. Coup, resolved to start an enterprise on his own responsibility. While, of course, he seeks to make the Aquarium remunerative to himself as an investment, yet in doing that he has manifested so much public spirit, and so much liberality towards educating the people of this city up to a proper appreciation of the study of icthyology and of fish culture, that I think we ought to take official action on this resolution, and recommend the Aquarium to the hearty support of the people

of New York and vicinity, and that they should give it every encouragement in their power. Mr. Coup has very kindly placed these rooms at our disposal for this, our annual meeting, and given us a free entrance to his magnificent Aquarium, and entertained us so magnificently last night, that I feel we cannot make the resolution too strong in recognition of his kindness and his public spirit.

Mr. Coup: I think you are altogether too complimentary, Mr. Blackford. I am already under obligations to yourself and others, as I acknowledged last night. Of course in the beginning of the Aquarium we knew that there were a great many difficulties to overcome, and in fact we found more than we had at first anticipated. A great portion of the material had to be brought from the other side, and the collections have been far more expensive than we had at first anticipated. However, I have had several flattering letters, and among the rest one from Mr. Lloyd, who is the originator of the Aquarium in London, saying, that from our catalogue it compares very favorably with that of the English Aquarium. In fact we have a great many specimens here that they have not been able to procure there yet. Of course they have some that we have not. The expense of building the Aquarium here was, of course, very great, and I am glad to say the public seem to appreciate it since its opening; and if we had had ordinarily good luck in our collection, it would have been certainly an established success at the present time. I hope it will be now, and that we can succeed in keeping the collections alive that have been brought, at a very great expense, so far. I want again to acknowledge my indebtedness to you, gentlemen, for your assistance, and I hope you will have your annual meetings in this room if the Aquarium does succeed, and we intend to use every effort to keep it as a first-class institution.

The resolution offered by Mr. Hallock was unanimously adopted.

The President : There is an advantage about the Aquarium that Mr. Coup might not regard precisely as an advantage from his stand-point, but it is so to the public at large, and that is the very fact of the changing character of it. The fish do die off more rapidly than I wish they did, for his sake ; at the same time, so far as the public are concerned—and that is a matter that ought to be brought to their attention—it is continually changing. The fish that are on exhibition here are replaced by others, new ones obtained continually ; and I have been surprised, coming here as I have, to see what a vast variety of fish have been presented here from time to time, some of them not living very long, and they being replaced by others of different kinds, and so showing a great number of species and varieties of fish ; and it is a matter that the public do not fully understand, I think, that the exhibition is one that is continually changing and continually presenting novelties that are interesting.

Mr. Wilmot : I can, in a most happy way to myself, indorse the sentiments that have been expressed in regard to this Aquarium. So far as I am personally concerned, I must say that I have received a vast amount of information, and I only regret that I cannot stay here a week or ten days that I might sit opposite these aquaria and watch the working of the fish, and by that means, I am satisfied, I should obtain much information that I do not now possess. Prof. Coup may rely upon one thing, and that is that when I return to my countrymen, and I am in conversation with any person who is coming to the City of New York, I shall tell them by all means to visit Prof. Coup's Aquarium, and they will receive a vast amount of information

by doing so. I think Prof. Coup is entitled to everything that is in the resolution, because he has done a vast amount of good, not only to the City of New York, but to the whole continent, in getting up this Aquarium. I think he is entitled to all the thanks and to all the eulogium you can give him for having started this; and although it may have been, in the first place, of a private nature, yet it is doing a vast amount of public good.

On motion of Mr. Phillips it was voted that when the Convention adjourn, they adjourn to meet at the Aquarium on the second Wednesday of February, 1878.

Mr. MATHER: I wish to say a few words with reference to the transportation of fish. We have in the tanks now some half a dozen whitefish which were brought from the Detroit River. The whitefish has been regarded as one of those fishes that it is impossible to transport any great distance. I never attempted it before, but I know of many others that have. I was up on the river a short time ago, and we got some. Thinking that it would be impossible, under ordinary circumstances, to transport them and get them here, I managed it in this manner: My assistant, whom I left there, I instructed to fill cans with snow—after the proper amount of water was put in—to put in the snow so thick as to chill them, and partly stupify them, and the snow would also act as a sort of cushion by which the scales would be kept from rubbing off; and they have been brought here successfully. I wish to make the process known for the benefit of future transporters of whitefish.

Mr. PORTER: I have frequently carried trout in snow, and I think it is a good way to carry them. A fisherman with snow can carry trout almost any distance; whereas, if you have ice ever so fine, you cannot carry them. I have never lost any scarcely when I carred them in snow.

Mr. HALL: If I am not trespassing too much upon the time of the gentlemen, I wish to say that there has been some information given me since I have been sitting here in regard to the specimens of trout that we have here upon the table, by Mr. Wilmot, and I think it might be interesting to the gentlemen, and I know it would be so to myself, if Mr. Wilmot would state the facts that he has in reference to it.

Mr. HALLOCK: I beg Mr. Wilmot's pardon for not asking him to say something upon the subject.

Mr. WILMOT: I am almost beginning to feel that I have monopolized too much of the time of this meeting; but I come from Canada, and I have come for the purpose of gaining information, and, if possible, giving some. I know very well the meeting is far advanced, and many gentlemen desirious of going home, but at the same time I think if anything can be learned we should endeavor to get possession of all that we possibly can. I am not prepared to say that I am going to give any knowledge in reference to this fish, but the gentleman who introduced it upon the table said he thought it should be cultivated in an artificial way, and I will state that we are engaged in that way now. The establishment on the Saginaw River has a large number of sea-trout ova now hatching out. I have been in the habit of catching these fish very numerously every year, and though I have come in collision in many instances with gentlemen who have different ideas on the subject of these fish, yet I am of the opinion that this fish, or the *salmo Canadensis* as it is termed by Mr. Hallock, is one and the same as the speckled-trout, or *salmo fontinalis*. I always had that belief. He says they are only caught for about six weeks in certain places. That can be easily accounted for. There is but a short period of time in which the leases are given by our Government to the salmon-fishermen. They come up these rivers with a fly, and are there

but a short time ; and during that short time, in many instances, is the very period when this fish is migrating from the sea to pass up the river for the purpose of depositing its eggs. He says they are prized more than other trout on account of their fine qualities. That is so ; salmon fishermen prefer to take them for their food, but it is to be accounted for in this way, that they come directly from the sea from their feeding-grounds, and they are fat and in fine condition ; and when they get up to where the salmon fisheries are they are in the best possible condition they could be. After three or four weeks they are not so delicate. These fish pass by and disappear and are not heard from for some time. It is because they pass by the river where these salmon fisheries are and pass to the upper branches where the salmon fishermen do not go. They go there and deposit their eggs and then return to the sea and put on fatness again for another migration another year. The color of all these fish in the sea, the salmonoid family, is different from what it is in fresh water. He is a bright, brilliant fish when he comes from the sea, and he gets darker as he goes up the river ; and when the month of November comes around he is a black, dirty, uncouth looking fish. So it is with this specimen ; when that fish came from the sea he was a bright, beautiful fish. As he passed up the stream he began to get discolored and get to be black. Therefore, the opinion that exists among gentlemen who go fishing upon our rivers in Canada in regard to that fish, is not altogether the correct one, from the fact that they do not see him only in a certain season when he is in a prime condition. Now there is a fish upon the wall which was caught in proper season. If that fish were caught in October or November, instead of being caught in July, as that was, no person in this room, I think, who had been engaged in fishing all his life-time, but would say it was a distinctly different fish altogether.

I have specimens in my cabinet now, in Canada, where they are put side by side, and gentlemen will look at them and say they are not the same fish at all. The change is so wonderful and great that it is almost impossible for any man to believe it unless he has seen the fish during the whole period of the year. They become transformed in shape. The male would become black as ink almost, and would have a projection on its lower jaw of an inch or an inch and a half long; therefore many people, who are not cognizant of the nature of the fish, say, "It cannot be the same kind of a fish that I caught in June last." It is the same way with all our fish that are migratory. The migratory fish all change wonderfully in their appearance and in their nature. That fish, therefore, in my estimation, is a *salmo fontinalis*, or a sea-trout, if you choose, or a *salmo Canadensis*. I have caught them, hundreds and hundreds, along the sea-coast, and I have caught them again away up in the small tributaries, perhaps 100 or 150 miles up the river, and they are just as different as you could possibly imagine two fish to be, but yet I am satisfied they are the identical fish. But in order to more fully prove this question, I instructed my assistant to gather a large number of ova of sea-trout, and he has collected 300,000 or 400,000, and the last report I heard from him was that they were just being hatched out. I have also brought some to Ontario, and I am going to put them into some of the lakes of Ontario. My theory is, when they are hatched out they will become what is called the speckled-trout there; and, on the contrary, if we take the eggs of our speckled-trout in the mountains, and hatch them and turn them into the sea, he will become that same fish, because he has a larger area and more food. If you take a stream in the country that is frequented by these little trout five or six inches long, and go to work and construct a dam covering two or three acres, in a few years

afterwards you will have trout weighing two or three pounds in that pond. It is because there is a larger body of water, and a larger amount of food than in the little stream of water. It is a matter of food altogether that produces the difference in size, and it is a matter of temperature of water to a great extent that gives the fish the variety of hues that we have present at certain seasons of the year. Therefore I feel it my duty—although, perhaps, my views do not coincide with my esteemed friend, Mr. Hallock, but I always feel it my duty to express my opinion or belief quite independent of whether it affects others or not—I do candidly believe, and I think the gentlemen of this Association almost generally indorse this opinion, that I express in regard to the sea-trout. I go so far as to believe that all the different kinds of salmon-trout—those that we catch in our great inland seas, salmon-trout weighing fifty, sixty, or seventy pounds, sometimes caught in Lake Huron and Lake Superior—were originally the salmon of the sea, and by some volcanic eruption and upheaval of the earth they have been at some very remote date thrown up by these eruptions into some of the lakes that were formed by the eruption inland, where they could not get out again, and they became transformed, after many years, to the different fishes that we now have frequenting these lakes. We know them all to be of the salmonoid family. And so it is, you can change any of the salmonoid family at your pleasure, if you will only devote sufficient time to carry out the experiment. Now that fish yonder: its father or grandfather or great-grandfather came from the sea, but I am confident that *he* never went to the sea. We had in Lake Huron, and a portion of the Georgian Bay, salmon which were planted there, the eggs of which were hatched in my establishment, and put into the rivers running into Lake Huron. Some fish have been caught there the last year which the fishermen

were not acquainted with. We never could get specimens of them because the people take little interest in the matter, but from the descriptions that have been given to me I am confident those are the same fish as that one now upon the wall. And if you can do that in one instance you can do it in another. Therefore I hold that the sea-trout, the *salmo fontinalis*, and the little speckled-trout, are one and the same thing.

Mr. HALLOCK: I have no doubt the gentlemen here will all be very much obliged to Mr. Wilmot for the information which he has given, and I am very glad to know that Mr. Wilmot speaks from facts, on investigation, and that what he has advanced has been based upon experiments; and while I do not wish at all to appear pedantic in opposition to a gentleman who has made this a study, I would like to state two facts to substantiate my opinion. These sea-trout are caught all down through the St. Lawrence River and down the coast of Nova Scotia, and I do not know that I have ever seen what I call sea-trout caught outside of the maritime provinces. How is it that we do not wait in the waters of Long Island and in the waters of Cape Cod, as they do in Canada, for the coming of these sea-trout? Another point: I have gone upon the Nova Scotia rivers. Those rivers are all short, generally they do not run more than three or four miles, sometimes they will run fifteen, and then they get to be brooklets. I have been there fishing, and generally at the mouths of brooks that run into those rivers I have fished and caught what are called the *salmo fontinalis*—similar exactly to those mountain trout—dark mottled salmon, bright crimson, and blue spots upon them distinct enough—but the general hue of the fish was, as Mr. Wilmot expressed it, dark; but that was early in the season. The Indians would say, "Now this is small fry, we will wait now for awhile and we will see the sea-trout come in, and then we will have some sport." I

have been fishing two weeks and caught these brook-trout every day, and then I would catch sea-trout. I have been fishing all the time and caught the same kind of fish, and up comes another kind as different as a black sheep is from a white one. I have continued fishing, and caught no more of these bright fish, but caught the dark ones until the fall. That, in my mind, seems to establish the fact that this fish is distinct and separate from the other.

Mr. WILMOT: May I ask you whether the fish that you were catching at the mouth of these little streams were not invariably small fish?

Mr. HALLOCK: They would weigh from a pound to a pound and a half.

Mr. WILMOT: The others would weigh three or four pounds?

Mr. HALLOCK: Yes, sir.

Mr. WILMOT: But a large majority that you caught at the mouths of these streams were small ones?

Mr. HALLOCK: I will stand corrected, and never rise again on this floor if Mr. Wilmot will tell me why those fish don't come together.

Mr. WILMOT: It is upon the same principle precisely that little children do not want to associate with men. These little fish can get all the food they want for their sustenance at the outlets of these little streams, and when they begin to get larger the requirements of their nature demand a larger supply of food, and they drop down the river until they get to the larger bodies where they get a larger amount of food, but they are compelled to return to the streams by instinct, to produce their young. Nature teaches them to go to their breeding-grounds. They pass by these little fish on their route upwards to the branches of the river, while these little fish as they grow larger

carry out the same routine, namely, going down to the larger bodies of water to get a larger amount of food.

Mr. HALLOCK: Why do not these same habits and conditions apply to these different streams on Long Island?

Mr. WILMOT: I cannot tell you.

The PRESIDENT: They do. I can confirm Mr. Wilmot in that. It is a matter which presented itself to my mind, and I wrote a book on the subject some twelve or fourteen years ago. It is the same opinion that Mr. Wilmot has expressed here. You ask why do not all the trout go to the sea? Simply because they do not want to. Some are migratory in their notions and some are not. I have a pond on Long Island, and some of my trout go to the sea and a great many do not. I have a fish-way, and every trout can leave my pond and go to the sea; but they do not do it. Some do. Last year there were as beautiful sea-trout caught below my pond as anywhere on Long Island.

Mr. HALLOCK: Those fish were caught in salt water?

The PRESIDENT: Yes, sir. We used to catch trout on the north side, in the salt water where they were coming right in from the salt water, bright, beautiful trout, but not quite so handsome as the sea-trout. I have followed the sea-trout right up the river. You speak of the Saginaw River, catching them at the mouth; and you catch them later when they have moved up; and you go away up in the head-waters and find them there. The first time I went with Mr. Witcher, which was a great many years ago, I visited the Nouvelle River and the sea-trout were very abundant. We struck the sea-trout at the mouth of that river, and we took them along up with us, and we found too a mixture of the sea-trout and the other trout; we found them in all conditions, changing from one to the other. We would go to a pool and catch the brilliant, bright sea-trout, and in the same pool we would catch the older fish that were darker, and

then we would take the dark ones that had evidently not gone to the sea at all. We would see in one day a tremendous school of fish come up in one of those pools, a school larger than would cross this entire room, solid, and they would pass around this pool making up their minds whether they would go up or not. We would see them pass in front of our camp, go up, go around, go back, go up. I would cast over them once in a while and raise one; and they would stay a day or two, and they would make up their minds to go up, and they were gone. Another thing confirms Mr. Wilmot's views concerning their visiting the larger lakes. I do not know whether he has investigated the upper part of Canada, the western part of Canada adjoining Lake Superior. I have spent some time there; I took in Lake Superior and Detroit, and there were some sea-trout; you could lay them alongside of one another—a trout that had never seen salt water—a magnificent, great sea-trout, and as brilliant as anything you ever saw, and as brilliant as any ever taken in the St. Lawrence River. We would take them right in the great lake where you could not see across, precisely the same thing as I have taken in the Nouvelle River and in the Saginaw and St. Lawrence. I followed those up in the same way. There was more rapid change of color there because the water is rather dark, flowing from swamps, etc. I caught trout there so dark that they were almost black. You look at them and at first you would say, "That never can be a trout; it is a black fish of some kind." I have taken below Carman's Point sea-trout that were exceedingly brilliant, and more so than anywhere else on Long Island, and I have observed the same thing in relation to these trout.

Mr. Wilmot: When my friend Hallock visits our Provinces, I hope he will go up the Dartmouth River, which is leased by a gentleman living in Boston. All the distance he can go up will

be with a canoe, twelve miles. There is a natural fall, an impassable barrier. He will find at the foot of that fall little speckled-trout an inch or two inches long, and he will find them running from that up to three and four pounds in weight; and if he goes about three yards below this deep pool, he will some morning see these sea-trout—the bright, brilliant ones—coming up, and he will catch them very readily. Then go up to the deep pool under the rock, and he will catch all these kinds, one with red fins, another with black; and if he stays there as late as October or November, all these bright ones will become black-sided and red-finned. They cannot get out. They all come up from the sea. The little ones lie off of the little streams, but in their migration they all congregate in this stream, and when October comes they drop down to the rapids below to lay their eggs.

Mr. HALLOCK: I would like to say, if I have formed wrong conclusions, it has been not from lack of observation and opportunity, for I have fished every part of the waters that Mr. Roosevelt speaks of and that Mr. Wilmot speaks of in the lower Provinces, Lake Superior, etc. I am quite aware that the color of trout changes with the water, that swampy water produces dark color, and *vice versa.*

Mr. WILMOT: If my friend, Mr. Hallock, could give me any data for the foundation of his arguments which would in any way upset the views which I entertain, of course I should gladly receive them, because my object is to seek information; but, from the experience I have have had in regard to this matter, it must be conclusive that they are one and the same thing, and I am corroborated by our esteemed President.

Mr. EVARTS: This is really a revival of the old question that was settled back ten, twelve, thirteen, or fourteen, years ago. A number of the fishermen that used to go up into the waters of

Maine to fish, and up to the waters of the St. Lawrence, and up those rivers that come into it, had a good many discussions on the subject of whether these larger trout, that were caught in the lakes of Maine, and trout coming from the salt water, the sea-trout, were the *salmo fontinalis*. Some of them, able men, some of them men of mind, men of discretion, men that could observe, maintained that they were not the same fish, that they were entirely different fish from the *salmo fontinalis*; so that the matter was put into the hands of Prof. Agassiz to determine, and he maintained that they were one and the same fish, whether they went to the salt water or the fresh-water seas.

Mr. Wilmot: But there is one thing that I would recommend to all gentlemen about stocking their ponds, and that is to get a stock of eggs from the largest trout they can get, because on the well-known principle that like begets like, you are more apt to have a large class of fish from breeding from large fish than from breeding from small ones.

Prof. Milner, from the Committee appointed in regard to forming sections, presented a report, which was adopted.

Mr. Evarts: In order to return the courtesy of our cousins over the line—Mr. Wilmot appearing here himself, and Mr. Witcher having sent his compliments—I move that we, as a body, return these compliments through Mr. Wilmot to Mr. Witcher.

The President: Mr. Witcher is known to many of us and to myself, personally, very well, and there has nobody been more active, nobody exhibits more energy, nobody exhibits more interest in the subject that we all have at heart than he; and the results that he has achieved bear the highest testimony to his capacity. Mr. Wilmot we all know, and we can almost repeat the same language in regard to him. He has originated many new suggestions in the matter of fish culture, has been

very successful himself, has been present at many of our meetings, and has always been a welcome addition.

The motion offered by Mr. Evarts was adopted.

Mr. WILMOT: I, in behalf of Mr. Witcher and myself I return you sincere thanks for the compliment you have paid us in expressing those handsome sentiments in regard to ourselves. I thank you cordially for the manner in which you have tendered it.

Mr. MATHER: If there is no subject under discussion now I should like to call the attention of the Society to an item that I saw in a newspaper about a week ago, perhaps, but which I have unfortunately lost, and cannot even tell what paper it was in. It was to the effect that certain parties in the vicinity of Mackinaw were about to place the first seal there, for the purpose of breeding, and if any gentleman wants to know what effect that will have upon the fisheries of that place, he can very easily see by observing the habits of the seal in the Aquarium. It is not what the seal eats so much as it is what he destroys. You can feed them all they will eat, which is an enormous quantity of fish, and then if they can get live fish they will play with them as kittens will kill mice. They are very quick in the water, and they will catch fish and come up and toss them from one to another, and then go down and catch another and kill it, and for every pound they actually eat they will kill twenty in play; and if there is such a movement on foot, I think this Association ought to enter a protest against it in some way.

Mr. EDMUNDS: We have recently seen seals in Lake Champlain, and the question was whether they had been carried there from some menagerie, or escaped from two different gentlemen who have some in the state; and I have from correspondence with parties in Montreal learned that they are being caught in

the St. Lawrence, and that they come up the Richelieu into Lake Champlain, not in great abundance, however.

Mr. WILMOT: This matter brings up another that is closely connected with it. The object of Mr. Mather is that we should by some means protest against the introduction of an animal that would be injurious to the fishing interests of the country. That can be carried out in another way, so far as fish are concerned. I am inclined to think that many of us are inclined to satisfy our fancy in introducing fish which are injurious. On the Detroit River, which is frequented almost wholly by whitefish, and where fishing has been carried on from time immemorial almost on an extended scale, it has of late years been very much diminished. The Government of Canada, now aided by that of the State of Michigan, have erected upon the east shore of the river a large whitefish breeding-establishment. The breeding of whitefish, of course, ceases about the 1st of April; that is, they generally hatch out about that time, and they are turned out, and the building, of course, would then go into disuse until the season again approaches in October or November for laying down the eggs. The fishermen—fishermen are generally greedy and very selfish—said, "Now, since you put this establishment up here, we want you to go to work and breed another kind of fish and put them into the Detroit River." They made an application to our Government that I should send my assistant and my employees to Lake Huron, and there collect large quantites of the eggs of what we term the pickerel, one of the most voracious and destructive fish that we have in our waters. The Government referred the matter to me, and asked my opinion. I reported adversely to it, and said: "I think you will be doing a great injustice to the fishermen themselves if you introduce into the same waters the bitterest and the most rapacious enemy of the whitefish. It would be, in

my estimation, just like putting into the same fold the wolf and the lamb. Whitefish are most innocent in their nature, not fish of prey, not predaceous in any way, and to put pickerel into the same streams, with an immense mouth and teeth, and jaws indicative of predaceous and rapacious habits, I think would be doing a very great wrong; therefore, if we were to satisfy the wish and the greed of these fishermen, we would perhaps turn out millions of this same kind of fish into the same waters where we are breeding whitefish." I am pleased to state that the Government did not acknowledge the petition that was sent in; that they took the advice of myself and did not do so. Therefore, as the subject has been brought up by Mr. Mather that we should not put in animals that are destructive of fish, the same argument holds good that you should not put in fish that are destructive of other fish. Gentlemen are too desirous of introducing some new thing or some new kind of fish into the waters. As another illustration, the St. John River was formerly a magnificent river for salmon, but of late years has become almost depleted of them, and it is said to have resulted partly from the fact of American gentlemen having, a number of years ago, put into one of the branches of it, pickerel. The consequence is that the young of the salmon are destroyed by this predacious fish. So I think it should be just as much a study with you to prevent, if possible, the introduction of voracious and predacious fish which are not as good fish for food. I think the whims of individuals should not be carried out that way. One man may think it is a nice thing to have wolves, and he may want to breed wolves. I say the law should protest against it. In Canada we do not allow a man to breed a wolf. We contend that in order to carry out aqua-culture, as we do agriculture, he should endeavor to preserve the better kinds of fish. I only make these remarks to show in my humble way

my interest, and to prevent, if possible, the introduction of the horrid fishes, if I may so speak, among the better and innocent kind.

The PRESIDENT: Mr. Blackford has given a great deal of attention to the results of all our efforts; that is, the quantity of fish that come into the market. I believe he is not thoroughly prepared with accurate statistics, being a good deal pressed by the necessities of this meeting, the weight of which fell very largely upon him, but I think he can give us in a rough way what will be interesting to us.

Mr. BLACKFORD: Mr. President, it was intimated to me previous to the meeting that it would be the pleasure of the Association to hear some facts in connection with the marketing of fish, but as the President says I was pressed with the necessities of this meeting just at that time, and had to devote my time to other matters, I thought I might say a few words, however, in reference to the supply of the various kinds of choice fish in our market, and I will speak first of the pompano. In the latter part of 1876 we received large quantities of pompano from Pensacola. They were shipped here by express in such quantities that the price which had previous to that time been from one to two dollars a pound, dropped right down to twenty-five or thirty cents. In a few months after that we received large consignments of pompano from Baltimore that were caught in the vicinity of Chesapeake Bay. They were caught in such quantities that the market became glutted with them there and they were shipped all over the country, a large portion of them to New York, and the price declined to ten cents per pound. Now the pompano is really worth more money, in comparison with other fish, than that; and the low price may be attributed to the ignorance of the people, generally, of the merits of the pompano. Probably there are a number of

gentlemen here now who really have never tasted a pompano. If people, generally, in New York knew the merits of the pompano the price would hold up fully to twenty-five cents a pound. Speaking of quantities, they would probably not exceed 1,000 to 1,500 a day for several days; and I will suggest right here to our esteemed Commissioner, Mr. Ferguson, as he is from that locality, that if a little inquiry is made into the habits of the pompano and the manner of catching them, thus bringing them into public notice, I think it would have a marked effect on the business.

Our friend, Mr. Wilmot, was speaking of the salmon. Probably the increased supply of salmon in New York during 1876 was more marked than at any time within my recollection, owing to the extension of the inter-colonial railway system, so that I think there is a branch running from Montreal down through the Restigouche region, and so on down to St. John's, also taking in Bathurst. The opening of this road in 1876 opened a new territory for fresh salmon for the market, and I was called upon by Mr. Mowat, from the department of Mr. Wilmot, who, on behalf of the fishermen there, wished to market their fresh salmon. And, by the way, while speaking of that, I made some inquiries as to the production of the river. I found that some ten years ago the salmon were very scarce in the Restigoche River, but owing to the efforts made by the Canadian Commission in hatching and protecting the salmon and to their protective laws, the increase had been wonderful; so much so, that the production of the estuary fish alone amounts to from 250,000 to 300,000 pounds, I think. This does not take in the production of the fisheries in the vicinity of Bathurst.

Mr. Wilmot: That is simply the reported quantities. There is a large amount besides.

Mr. Blackford: In the latter part of June large quantities

of salmon were shipped to New York from Bathurst, and the price declined until the retail price in the New York market was ten cents per pound. Only think of it, salmon, one of the choicest fish we have! I had the curiosity to inquire of Mr. Mowat to what he attributed mostly this great increase, whether to fish hatching, or the protective laws, which was entitled to the most credit, and he answered unhesitatingly, "I think that it was the protective laws that were entitled to the greatest share of credit; that although fish hatching and propagating supplied to a great degree the waste." Yet the protective laws, he thought, were more efficacious in increasing the supply. I speak of that here because I think that in New York, if the laws were more stringent in regard to our shad, we should find a very much more marked increase in the supply.

The increase of shad in the market has not been so great as we had reason to expect from the vast quantity of eggs that are hatched and turned loose, but owing to the persistent fishing of the waters all the time, Sundays included, the fish have no chance to get up the river, but, with one day's rest for the fish, it would probably greatly increase the supply.

The terrapin has had some attention paid to it, in regard to seeing whether it should be cultivated, and the supply increased in our waters, through the enterprise of a dealer in our market, Mr. Benjamin West. He established a pen on the New Jersey shore, in the vicinity of Long Branch, in which, during the summer months, when terrapin are not in season here—folks do not call for them, they are not marketable—large quantities are shipped to New York from Texas and the Southern States; so that the price, which in the terrapin season is usually from $12 to $15 a dozen, in the summer time is as low as $2 50 and $3. They purchase a large quantity of terrapin during the summer, and place them in these pens and feed

them, and carry them over through the winter months, and put them upon the market, but their success in caring for the terrapin has not been very marked, owing to some reason or other, not understanding fully the kind of food that they require, the terrapin does not possess the delicate flavor which the genuine diamond-back "Chesapeake" has. The general criticism is that they are fishy. That is perhaps owing to the amount of fish that is fed to them, and not having their natural food. These terrapin were found to lay their eggs quite plentifully. From these eggs the young were hatched out in the sand, and they made their escape to the sea through the interstices of the pen. I think, perhaps, in a few years we shall have quite an increase from this cause in the number of terrapin caught in this vicinity.

Mr. EDMUNDS introduced a resolution in memory of the death of members of the Association.

On motion of Mr. MATHER it was ordered that the Association purchase a book-case to keep the records, books, and papers, in, to be placed in the reading-room of the Aquarium building.

On motion of Mr. PHILLIPS the Convention adjourned.

Constitution.

ARTICLE I.—Name and Objects.

The name of this Society shall be "The American Fish Culturists' Association." Its objects shall be to promote the cause of Fish Culture; to gather and diffuse information bearing upon its practical success; the interchange of friendly feeling and intercourse among the members of the Association; the uniting and encouraging of the individual interests of Fish Culturists.

ARTICLE II.—Members.

Any person shall, upon a two-thirds vote of the Society, and a payment of three dollars, be considered a member of the Association, after signing the Constitution. The annual dues shall be $3.00.

ARTICLE III.—Officers.

The officers of the Association shall be a President, a Vice-President, a Secretary, a Treasurer and Executive Committee of three members, and shall be elected annually by a majority of votes; vacancies occurring during the year may be filled by the President.

ARTICLE IV.—Meetings.

The regular meetings of the Association shall be held once a year, the time and place being decided upon at the previous meeting.

ARTICLE V.—Changing the Constitution.

The Constiution of the Society may be amended, altered, or repealed, by a two-thirds vote of the members present at any regular meeting.

Members of the American Fish Culturists' Association.

Ambler, Andrew S., Danbury, Conn.
Anderson, A. A., Bloomsbury, N. J.
Baird, Spencer F., U. S. Commissioner of Fish and Fisheries, Washington, D. C.
Betteman, C. G., Greenville, N. J.
Blackford, E. G., New York City.
Boardman, H. G.
Boyer, B. Frank, Reading, Pa.
Bradley, Richards, Brattleboro, Vt.
Brewer, J. D., Muncey, Pa,
Bridgman, J. D., Bellows Falls, Vt.
Burges, Arnold, West Meriden, Conn.
Bush, John T., Niagara Falls, Canada.
Chandler, F. J., Alstead, N. H.
Chrysler, Gifford W., Kinderhook, N. Y.
Chrysler, M. H., Kinderhook, N. Y.
Clift, William, Mystic Bridge, Conn.
Colburn, Charles S., Pittsford, Vt.
Collins, A. S., Caledonia, N. Y.
Coup, W. C., New York City.
Crocker, A. B., Norway, Maine.
Edmunds, M. C., Weston, Vt.
Evarts, Charles B. Windsor, Vt.
Farnham, C. H. Milton, N. Y.
Farrar, Benjamin, St. Louis, Mo.
Ferguson, T. B., Annapolis, Md.
Gill, Theodore, Washington, D. C.
Good, G. Brown, Washington, D. C.

Green, Seth, Rochester, N. Y.
Hallock, Charles, New York City.
Hessel, Rudolph, Offenburg, Germany.
Heywood, Levi, Gardner, Mass.
Holley, W. P. Katonah, N. Y.
Hooper, H. H., Charleston, N. H.
Hunt, J. Daggett, Summit, N. J.
Hunt, N. W., 70 Lee Avenue, Williamsburg, L. I.
Hunt, Luther B.
Huntington, Dr., Watertown, N. Y.
Hutchinson, Chas., Utica, N. Y.
Jerome, George H., Niles, Mich.
Jewett, George, Fitchburg, Mass.
Kent, Alexander, Baltimore, Md.
Kingsbury, C. A. Dr., 1119 Walnut St., Philadelphia.
Lamberton, Alexander B., Rochester, N. Y.
Ledyard, L W., Cazenovia, N. Y.
Lees, Edward M., Westport, Conn.
Lowrey, G. P., Tarrytown, N. Y.
Lyman, Theodore.
Maginnis, Arthur, Stanhope, Pa.
Malcomson, A. Bell, Jr., New York City.
Mann, J. F., Lewiston, Pa.
Mather, Fred. N. Y.
Milner, James W., Washington, D. C.
McGovern, H. D., Brooklyn, N. Y.
Neidlinger, Phil., New York City.
Newell, W. H., San Francisco, Cal.
Page, George S., New York City.
Parker, Wilbur F., Meriden, Conn.
Paxton, E. B., Detroit, Mich.
Phillips, B., Brooklyn, N. Y.
Porter, B. B., Colorado.
Price, Rodman M., N. J.
Redding, B. B., San Francisco, Cal.
Redding, George H., Stamford, Conn
Reeder, H. J., Easton, Pa.

Richmond, W. H. Scranton. Pa.
Robinson, R. E.
Rockford, A. P., Salt Lake City, Utah.
Roosevelt, Robert B. Hon., New York City.
Saltus, Nicholas,-New York City.
Shultz, Theodore, New York City,
Smith, Greene, Pelerboro, Va.
Sprout, A. B., Muncey, Pa.
Sterling, E., Cleveland, Ohio.
Stone, Livingston, Charleston, N. H,
Stoughton, E. W., Windsor Vt.
Tagg, Henry, Philadelphia, Pa.
Thomas, H. H., Randolph, N. Y.
Tileston, W. M.., New York City.
Van Cleve, Joseph, Newark, N. J.
Van Wyck, J. T., New York City.
Ward, George E., New York City.
Whitcher, W. F., Ottawa, Ontario, Canada.
Whitcomb, T., Springfield, Vt.
Whitin, Edward, Whitinsville, Mass.
Wilmot, Samuel, Newcastle, Ontario, Canada.
Worrall, James, Harrisburgh, Pa.
Dr. Yarrow, H. C., U.S.A., Washington, D. C.

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